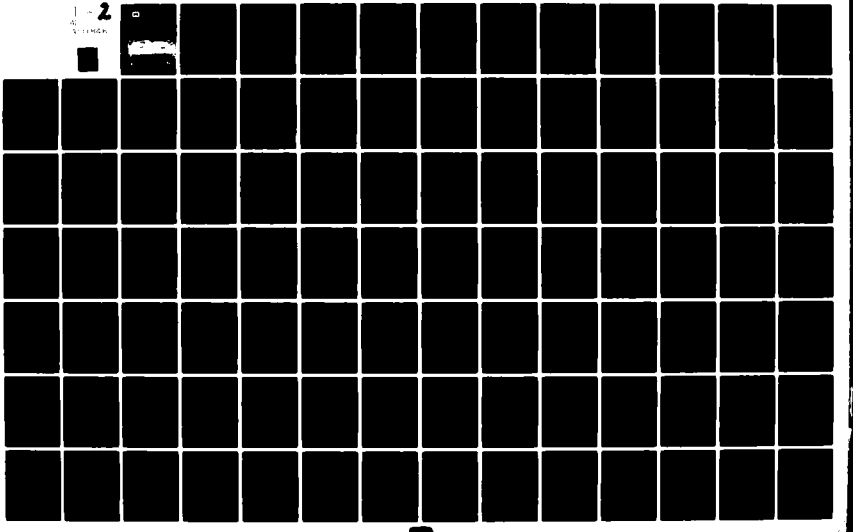
AD-A111 848 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS F/G 8/8
USER'S GUIDE FOR THE POTAMOLOGY DATA PROCESSING SYSTEM (PODAPS)--ETC(U)
JAN 82 W L ENETE, S BROOKS
UNCLASSIFIED WES-INSTRUCTION-K-82-2 NL




1 OF 2
AD-
A111848
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART

INSTRUCTION REPORT K-82-2

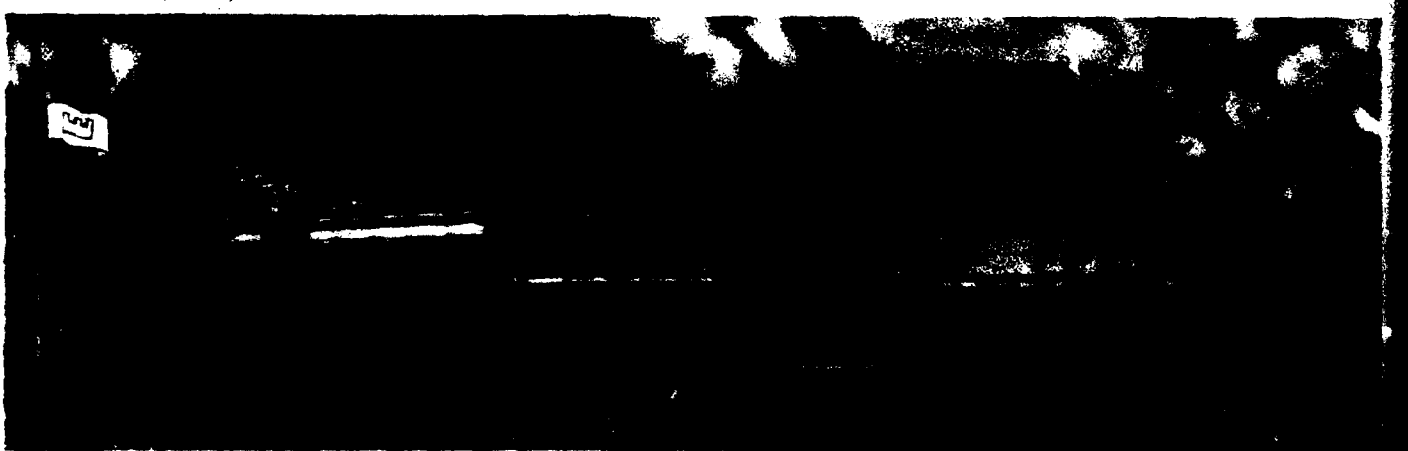
USER'S GUIDE FOR THE POTAMOLOGY DATA PROCESSING SYSTEM (PODAPS)

by

Walter L. Enote, Sherry Brooks

Automatic Data Processing Center
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

January 1982
Final Report



Prepared for U. S. Army Engineer Division, Lower Mississippi Valley
P. O. Box 80, Vicksburg, Miss. 39180

Destroy this report when no longer needed. Do *not* return it to the originator.

The findings in this report are *not* to be construed as an official Department of the Army position unless so designated by other authorized documents.

The contents of this report are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Instruction Report K-82-2	2. GOVT ACCESSION NO. AD-A111848	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) USER'S GUIDE FOR THE POTAMOLOGY DATA PROCESSING SYSTEM (PODAPS)		5. TYPE OF REPORT & PERIOD COVERED Final report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Walter L. Enete Sherry Brooks		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Waterways Experiment Station Automatic Data Processing Center P. O. Box 631, Vicksburg, Miss. 39180		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Division, Lower Mississippi Valley P. O. Box 80, Vicksburg, Miss. 39180		12. REPORT DATE January 1982 13. NUMBER OF PAGES 96
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Available from National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Data collection systems
Data processing
Mississippi River
Potamology

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Potamology Data Processing System (PODAPS) is an integration of several analysis programs and a data base of hydrologic data into a user-oriented analysis tool. PODAPS helps the user analyze gage station and cross-sectional survey data as required for use in several various kinds of studies. Various forms of output are provided for ranging from tabulated results and statistical computations to printer and graphics terminal plots.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Preface

This guide describes the use of the Potamology Data Processing System (PODAPS) including a brief discussion of the programs and their output. Users are urged to forward comments (pertaining to problems encountered in its use) to the authors.

The programs and data base comprising PODAPS were assembled by personnel of the Automatic Data Processing (ADP) Center, U. S. Army Engineer Waterways Experiment Station (WES), under sponsorship of the U. S. Army Engineer Division, Lower Mississippi Valley (LMVD). Liaison was maintained with LMVD through the Potamology Branch, Mr. James Tuttle, Chief.

Program development was primarily the responsibility of Mr. Walter L. Enete, Operations Research Analyst, Computer-Aided Design Group (CADG), ADP Center, with assistance from Ms. Billye B. Barfield, Ms. Sherry Brooks, Ms. Dorothy B. May, Mr. John Stephens, and Mr. Bindley Williams. These latter made significant contributions to the graphics and update programs. Ms. Brooks also was responsible for loading much of the data base. This guide was prepared by Mr. Enete and Ms. Brooks under the direction of Mr. Paul K. Senter, CADG. The work was done under the supervision of Mr. William A. Price, Chief, CADG, and Dr. N. Radhakrishnan, Special Technical Assistant, ADP Center, and under the general supervision of Mr. Donald L. Neumann, Chief, ADP Center.

The University of Missouri at Rolla is also credited with writing three programs performing statistical analyses of the data.

Directors of WES during the preparation and publication of this guide were COL J. L. Cannon, CE, COL N. P. Conover, CE, and COL T. C. Creel, CE. Technical Director was Mr. F. R. Brown.

Contents

	Page
Preface	1
Conversion Factors, Inch-Pound to Metric (SI) Units of Measurement	3
Introduction	4
Purpose	4
Scope	4
Data Base Organization	4
Program Descriptions	6
Maintenance programs	6
Daily update program	6
Analysis Programs	7
Gage station analyses	7
Cross-sectional survey analyses	8
Miscellaneous report programs	8
File Access and Security	8
Appendix A: Subcatalog Structures, Contents, and Formats	A1
Gage station files	A1
Dike, levee, and revetment files	A2
Cross-sectional survey files	A2
Dredge file	A3
Appendix B: Maintenance/Update Programs	B1
PUØ1A	B1
PUØ1B	B3
PSØ1	B4
PLØ1	B4
Appendix C: Gage Station Analysis and Display Programs	C1
P111A	C1
P222A	C6
P331B	C6
P332B	C12
P333B	C18
P400A	C23
Appendix D: Hydrologic Cross-Sectional Analysis Program	D1
Technical considerations	D1
Program description	D6
Appendix E: Miscellaneous Programs and Executions	E1
PDØ1	E1
Other programs	E3

Conversion Factors, Inch-Pound to Metric (SI) Units of Measurement

Inch-pound units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
cubic feet per second	0.02831685	cubic metres per second
cubic yards	0.76455486	cubic metres
feet	0.3048	metres
inches	2.54	centimetres
miles (U. S. statute)	1.609344	kilometres

USER'S GUIDE FOR THE POTAMOLOGY DATA PROCESSING SYSTEM (PODAPS)

Introduction

Purpose

1. This user's guide is intended to give detailed instructions, examples, and, where necessary, methodology employed for the Potamology Data Processing System (PODAPS). It is a result of efforts to bring together into one entity certain data collected on the Lower Mississippi River over the last 100 years, computerize the data, and provide programs to perform certain analyses of the data. This combination is expected to provide valuable assistance to engineers throughout the Lower Mississippi Valley Division (LMVD) in accomplishing the tasks of floodplain management, channel improvement, and flood control.

Scope

2. PODAPS is essentially a data management and analysis system for collecting, processing, and storing data pertaining to the Mississippi River on a daily basis. Information is also stored on control structures such as dikes, levees, and revetments and on dredging operations. Cross-sectional survey data are also part of the data base. These data all pertain to LMVD's area of responsibility. In order to process and present usable information from the data base, several programs have been developed to assist the Districts and LMVD in obtaining their desired analyses. Figure 1 gives the general framework of PODAPS. Each District may access the data files to obtain listings of data for its District or use the programs to perform various analyses of selected reaches as desired.

Data Base Organization

3. Six major file types comprise the PODAPS data base: gage station data; dike, levee, and revetment data (each a separate file

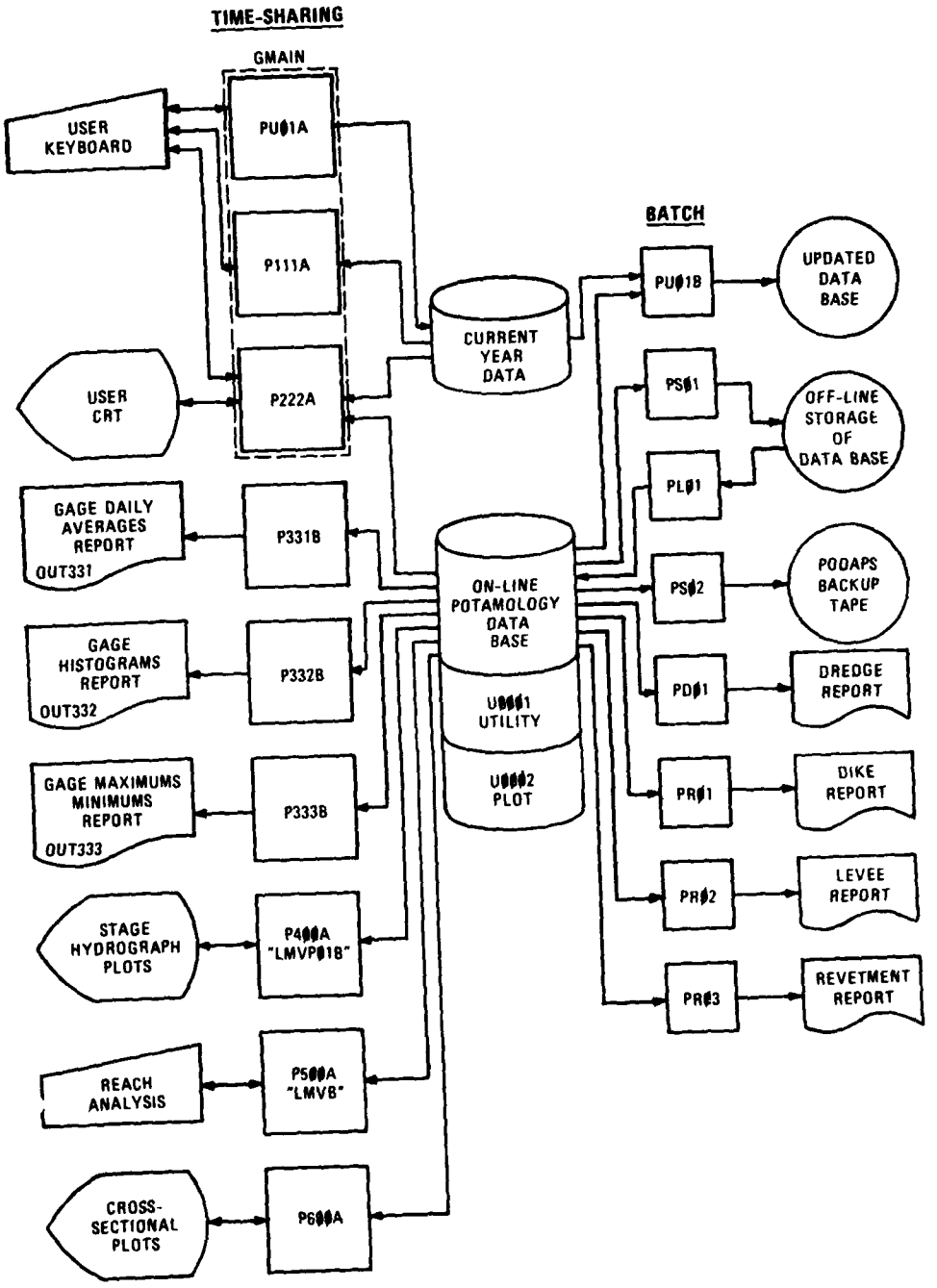


Figure 1. PODAPS framework

type); dredge operations data; and cross-sectional survey data. Formats for each file type are given in Appendix A. At present, there are 52 gage station files, 14 dike files, 9 revetment files, 8 levee files, 5 cross-sectional survey files, and 1 dredge file, totaling over 24 million characters of data.

4. These files are organized into groupings called subcatalogs to ease the burden of maintenance and storage on the computer. The subcatalog contents are shown in Appendix A.

Program Descriptions

Maintenance programs

5. Currently, four programs are used to update and maintain PODAPS. Three of these provide means for storing the files and programs on tape or reloading them from tape to disk. The fourth program updates the master data base with the current year's data after it has been compiled. These four programs are (see Figure 1):

a. PUØ1B. Updates the data base with the current year's data.

b. PSØ1. Unloads the data base onto tape.

c. PLØ1. Loads the data base from tape back to disk.

d. PSØ2. Makes a system save tape of all data files and program files for backup in the event the computer goes down due to a malfunction.

See pages B3-B5 in Appendix B for sample executions.

Daily update program

6. Program PUØ1A allows the user to add data to the CURRENT YEAR data file. Data entered consist of the gage identification code, stage, flow, temperature, and rainfall. Format for the record is given in Appendix B. The file will contain at most 1 year's data, at which time it is added to the data base. See pages B1-B3 in Appendix B for a sample execution.

Analysis Programs

7. The analysis programs are grouped by application to a particular set of data files in the data base and according to the functions they perform.

Gage station analyses

8. P111A is the time-sharing program that allows the user to perform some analyses on the current year's data. He may select from a set of four options using various combinations and obtain tabulated results; plots from either a printer or a graphics terminal, depending upon type of terminal available; and statistical values such as maximum and minimum stage and flow, dates, and average stage and flow for a selected time period.

9. Program P222A performs a comparison of selected periods from selected gage files. It provides the same options as P111A but with the added features of comparing a history gage file against the current year's file or selecting a period overlapping 2 years on a history file.

10. See page C2 in Appendix C for a sample execution and output from P111A and page C4 for the same for P222A.

11. In support of a study, "LMVD Potamology Study (T-1)," the University of Missouri at Rolla wrote three statistical analysis programs for use on the potamology gage station data files. These have been included in PODAPS to provide the statistical analyses desired by the user. They are (Figure 1):

a. P331B. Computes average flow and stage values, maximums and minimums, and dates of occurrences and gives both terminal and batch printer output.

b. P332B. Provides histograms of stage and flow data for extended time periods covering several years.

c. P333B. Develops recurrence intervals of various stage and flow levels. Batch output is provided in both programs. For a more complete discussion of these programs, the user is directed to the report by the University of Missouri, "LMVD Potamology Study (T-1)," dated June 30, 1976. See pages C6-C22 of Appendix C for sample execution.

12. The last program for providing a display of gage data is a

CRT-oriented graphics plot routine, P4ØØA. It provides the user a choice of gage station, year, and type of plot to be made. Operating under the Corps' Graphics Compatibility System, it provides the user a quick means of viewing a year of data. A sample execution is shown on page C23 of Appendix C.

Cross-sectional survey analyses

13. Two programs are used for the survey analyses, both operating in time-sharing:

a. P5ØØA. Computes weighted hydraulic reach values for a selected reach. The reach is specified by beginning and ending river mile. Values computed are weighted averages for channel width (W), hydraulic radius (R), cross-sectional area (A), A/W ratio, and $AR^{2/3}$ value. See page D2 of Appendix D for a more complete discussion.

b. P6ØØA. A cross-sectional plot routine allowing the user to obtain a CRT plot of a selected cross section. See page D9 of Appendix D for a sample execution.

Miscellaneous report programs

14. Four report programs are available to generate reports from the dredging, dike, levee, and revetment files. Each of these runs as a batch program and is written in COBOL. They are:

a. PDØ1. Generates the dredge operations report.

b. PRØ1. Generates the dike report.

c. PRØ2. Generates the levee report.

d. PRØ3. Generates the revetment report.

A sample execution of each is found in Appendix E.

File Access and Security

15. As all Districts in LMVD have an interest in the potamology data base, procedures have been developed to permit them easy access to it. The user can copy a file for his own use, print the file at some printer site, or use it in his own special program. However, no changes are permitted to a file without going through the data base manager at the Waterways Experiment Station.

16. To access any file, either data or program, the user logs on

to the computer using his own userid and password. Upon a successful logon, the computer responds with:

```
* SYSTEM
```

Now the user is ready to select the desired file and call that file up to working level. For example, if he wants to access a gage station file in subcatalog RIVER, the command

```
GET AØDPLMVD/RIVER/filename,R <CR>
```

would be used. The file would be placed in his available file table for use with read permission only. Thus, the user would not be able to make any changes to the file contents but could use the file in a program, print the file, copy to another file, etc.

Appendix A: Subcatalog Structures, Contents, and Formats

Gage station files

1. Currently, some 52 gage station files are stored on the computer. Recording mode is BCD, 80-character card image records. Below is a list of the files showing the computer file name of each file. Each name is an 8-character (or less) name identifying a particular file on the computer. This name must be used when working with the file. The subcatalog name is GAGES.

NUMADRID	HICKMAN	LITLROCK
CAIRO	MEMPHIS	GRENVILE
CARUVILE	HELENA	LAKEPROV
ST.LOUIS	CLARENDN	STJOSEPH
CHESTER	PADUCAH	REDRIVER
THEBES	METROPOL	BATONRGE
SELMA	FULTON	ALEXANDR
ALTON	ARKANSAS	SIMESPRT
HERMANN	VICKSBRG	MEREDOSI
KEOKUK	NATCHEZ	
BISSELPT	MOCSPRGS	BEECHRDG
ENGDEPOT	CPGIRARD	PINEBLUF
JEFFBARR	GRAYSPT	WHITERIV
BRICKEY	CNTROCK	WARFIELD
LITROCKL	COMMERCE	ROSEDALE
REDROCKL	PRICELND	VBURGCAN
GRDTOWER	THOMPSON	GRENWOOD
REDWOOD	BELZONI	

2. Each gage file consists of 3 record types as follows:

   a. A header record consisting of the data elements station code, year, bankfull reading of the gage (in feet), and drainage area (in acres) served by the gage. Format is (7X,A8,I10,F10.1,I10).

   b. Stage readings recorded by month. Format is (10F7.2). Data are recorded to the nearest tenth of a foot.

   c. Flow readings recorded by month. Format is (7I10). Data are recorded in cubic feet per second.

3. Table A1 lists the station identification code and file name for each gage. Table A2 lists information on the availability of data

for each gage station which can be of considerable use in executing the gage analysis programs.

Dike, levee, and revetment files

4. The dike, levee, and revetment files consist of data pertaining to construction of these structures and any subsequent modifications. Table A3 lists the file names under their subcatalog. The organization and record format of these files are given in Tables A4-A7.

Coss-sectional survey files

5. Data in the survey files represent cross sections of the river taken at intervals of approximately 0.2 mile.* Each survey consists of a series of recorded depths (elevations in feet above mean sea level) as measured at successive points starting from the left bank and proceeding across to the right bank. The current files contain data only for the Memphis District broken into five segments each corresponding to the year of the survey.

6. Formats for the files are essentially the same as those for the HEC-2 (a program of the Hydrologic Engineering Center) programs. These are as follows:

a. T1 record. Contains year of survey and river mile plus other data not used in any of the programs in PODAPS. Format is (A2,30X,F8.2,4X,I4). Data items are:

Record type	- "T1" -	A2
River mile	-	F8.2
Year	-	I4

b. T2 record. Skipped if present in file.

c. X1 record. Contains river mile, number of points in survey, and left and right bankfull points. Format is (A2,F6.2,6X,I2,2I8). Data items are:

Record type	- "X1" -	A2
River mile		F6.2
Number of points		I2
Left bankfull point		I8
Right bankfull point		I8

d. GR record. Contains survey data points in depth-distance order, five pairs per record, until all points indicated in the X1 record are included. Format is (2X,F6.1,I8,4(F8.1),(I8)). Data items on each record are:

* A table of factors for converting inch-pound units of measurement to metric (SI) units is presented on page 3.

Record type - "GR" - skipped by format	
1st depth	F6.1
1st distance	I8
Next 4 points	
Depth	F8.1
Distance	I8

The data file is in the form:

```
T1197375   40574  953.62          953.62    19623000R1          890733.4365835.7
T2       890737.4365923.5       C0000
X1953.62      49
GR 289.0    6676   284.0    6778   284.0    6879   281.0    6960   280.0    7038
GR 281.0    7221   275.0    7313   278.0    7397   281.0    7497   282.0    7610
GR 280.0    7728   276.0    7824   275.0    7917   274.0    8017   272.0    8107
GR 270.0    8204   262.0    8314   263.0    8412   260.0    8529   259.0    8612
GR 259.0    8672   260.0    8744   254.0    8927   257.0    9008   256.0    9135
GR 254.0    9224   253.0    9328   247.0    9433   245.0    9505   246.0    9597
GR 247.0    9701   248.0    9795   248.0    9896   249.0   10008   249.0   10112
GR 251.0   10204   252.0   10305   254.0   10386   257.0   10506   264.0   10616
GR 266.0   10722   268.0   10830   268.0   10921   268.0   11016   271.0   11128
GR 273.0   11210   274.0   11308   275.0   11397   278.0   11560
```

7. Subcatalog HYDRODATA contains the current cross-sectional survey files:

a. HYDRO-1. Survey year 1973.

b. HYDRO-2. Survey year 1962.

c. HYDRO-3. Survey year 1948.

d. HYDRO-4. Survey year 1913.

e. HYDRO-5. Survey year 1879.

Dredge file

8. The dredge file contains dredging information for all Districts for the period 1930-1976. Included is the amount of cubic yards removed for three types of dredging operations: maintenance, construction, and miscellaneous. Each type is identified in the data by the type dredge used for the operation.

9. Format for the dredge record is:

(A4,8X,A2,18X,A4,1X,I3,1X,I1,3X,I1,1X,I3,1X,I1,19X,A2,6X)

10. Data items are:

District code	- A4
Year	- A2
Dredge code	- A4
V1 - cubic yards (1000's)	- I3
V2 - cubic yards (units)	- I3

V3 - cubic yards (tenths) - I1

C1 - costs (1000's of $) - I1

C2 - costs (units) - I3

C3 - costs (tenths) - I1

Purpose - A2

11. The cubic yards dredged and total costs, both in thousands, are found as follows:

Total Cubic Yards = V1(1000) + V2 + V3(0.1)

Total Costs = C1(1000) + C2 + C3(0.1)

12. The dredge file is in the subcatalog DREDGES.

Table A1

Station Identification Codes and File Names for Gages

Gage	Station Identification Code	File Name
New Madrid, Mo.	00017164	NUMADRID
Cairo, Ill.	00060024	CAIRO
Caruthersville, Mo.	00017166	CARUVILE
St. Louis, Mo.	07010000	ST.LOUIS
Chester, Ark.	07020500	CHESTER
Thebes	07022000	THEBES
Selma	00027165	SELMA
Alton, Ill.	05587500	ALTON
Hermann, Mo.	06934500	HERMANN
Keokuk, Iowa	05474500	KEOKUK
Meredosia, Ill.	05585500	MEREDOSI
Hickman, Ky.	00017162	HICKMAN
Memphis, Tenn.	07032000	MEMPHIS
Helena, Ark.	07047970	HELENA
Clarendon, Ark.	07077800	CLARENDN
Paducah, Ky.	03609500	PADUCAH
Metropolis, Ill.	03611500	METROPOL
Fulton, Ark.	00017170	FULTON
Arkansas City, Ark.	07265450	ARKANSAS
Vicksburg, Miss.	07289000	VICKSBRG
Natchez, Miss.	00016660	NATCHEZ
Little Rock, Ark.	07263450	LITLROCK
Greenville, Miss.	00016655	GRENVILE
Lake Providence, La.	00016656	LAKEPROV
St. Joseph, La.	00016659	STJOSEPH
Red River Landing, La.	07373290	REDRIVER
Baton Rouge, La.	00016866	BATONRGE
Alexandria, La.	07355500	ALEXANDR
Simmesport, La.	07381490	SIMESPRT

(Continued)

Table A1 (Concluded)

Gage	Station Identification Code	File Name
Greenwood, Miss	129	GRENWOOD
Pine Bluff, Ark.	Pine Bluff	PINEBLUF
White River, Ark.	W-5	WHITERIV
Warfield Point, Miss.	Warfield Point	WARFIELD
Rosedale, Miss.	M-O	ROSEDALE
Vicksburg Canal, Miss.	W-6-A	VBURGCAN
Bissel Point	0183A	BISSELPT
Engineer Depot	0176A	ENGDEPOT
Jefferson Barracks, Mo.	0168A	JEFFBARR
Brickey	0136A	BRICKEY
Little Rock Landing, Ark.	0125A	LITROCKL
Red Rock Landing	0094A	REDROCKL
Grand Tower	0081A	GRDTOWER
Moccasin Springs	0066A	MOCSPRGS
Cape Girardeau, Mo.	0052A	CPGIRARD
Grays Point	0046A	GRAYSPT
Counterfeit Rock	0042A	CNTROCK
Commerce	0039A	COMMERCE
Price Landing	0030A	PRICELND
Thompson Landing	0020A	THOMPSON
Beechridge	0002A	BEECHRDG
Belzoni, Miss.	353	BELZONI
Redwood, Miss.	129-B	REDWOOD

Table A2

Gage Master File Contents Available Data

File Name	Stage Data Only	Stage and Discharge Data	Discharge Data Only	Data Contain All Zeros	Bankfull Stage
ALEXANDR	1927, 1929	1930-1978			34.0
ARKANSAS	1922, 1926, 1927, 1978	1929-1977			44.0
CHESTER[1]	1922, 1926, 1927, 1929, 1978	1943-1977			26.0
KEOKUK[2]	1922, 1926, 1927, 1929	1930-1973	1974, 1975		14.0 (1922) 16.6 (1930)
PADUCAH[2]		1974-1977	1929-1973		31.0
REDRIVER	1922, 1927	1929-1978			45.0
ST.LOUIS[1]	1978	1922, 1926, 1927, 1929, 1934-1977,			30.0
VICKSBRG[2]	1922, 1926, 1927, 1978	1929, 1931-1977			43.0
THEBES[1,3]	1978	1934-1977			33.0
HELENA	1922, 1926, 1927	1929-1977			41.0

(Continued)

1 1974, months 9-12, contain all zeros.
2 1973, months 9-12, contain all zeros.
3 1978, month 1, has both stage and discharge data.

Table A2 (Continued)

File Name	Stage Data Only	Stage and Discharge Data	Discharge Data Only	Data Contain All Zeros	Bankfull Stage
HERMANN[1]	1922, 1926, 1927	1930-1974	1975-1977		21.0
SIMESPRT[4]	1929, 1978	1930-1977		1927	46.0
MEREDOSI[5]	1922, 1926, 1927, 1929, 1978	1939-1977			10.0
LITLROCK[6]	1922, 1926, 1927, 1929, 1972-1978	1930-1971			23.0
METROPOL		1936-1975	1929		43.0
CLARENDN	1922, 1926, 1927	1929-1977			30.0
ALTON[1,5]	1922, 1926, 1927, 1929, 1978	1934-1977			420.6
MEMPHIS	1922, 1927, 1929	1933-1977			34.0
HICKMAN		1930-1977	1928, 1929		37.0
NATCHEZ	1872-1935, 1949, 1978	1936-1948, 1950-1977			48.0

(Continued)

[1] 1974, months 9-12, contain all zeros.
[4] 1927, months 3-6, have stage data only.
[5] 1977, months 9-12, have stage data only.
[6] 1929, months 1-4, contain all zeros.

Table A2 (Continued)

File Name	Stage Data Only	Stage and Discharge Data	Discharge Data Only	Data Contain All Zeros	Bankfull Stage
STJOSEPH[7]	1882-1884, 1916-1978	1889-1908, 1910-1914		1881	40.0
GRENVILE[8]	1922, 1926, 1927, 1929, 1941-1978			1940	45.0
SELMA[9]		1966-1978		1965	390.0
FULTON	1922, 1925, 1926-1977				34.0
LAKEPROV[10]	1872-1963, 1965-1978			1964	37.0
BATONRGE[11]	1922, 1927, 1929	1931-1945 1947-1956			30.0
NUMADRID	1925-1977				40.0
CAIRO[12,13]	1858-1868 1925-1977				44.0
CARUVILE	1930-1977				35.0

(Continued)

7 1881, months 2-6, have stage data only.
8 1940, months 11-12, have stage data only.
9 1965, months 11-12, have stage data only.
10 1964, months 3-5, have stage data only.
11 1922, months 6-12, contain all zeros.
12 1858-1864, contain intermittent months of all zeros.
13 1868, months 9-12, contain all zeros.

Table A2 (Continued)

File Name	Stage Data Only	Stage and Discharge Data	Discharge Data Only	Data Contain All Zeros	Bankfull Stage
GRENWOOD[1]	1905-1928	1929-1978[14] 1979[15]			35.0
BELZONI					34.0
REDWOOD	1950-1965, 1967-1978	1935-1942 1947-1949[14], 1966, 1979			54.0
PINEBLUF	1905-1978				25.0
WHITERIV	1871-1899, 1901-1957				44.0
WARFIELD	1936-1952				39.0
ROSEDALE	1957-1978				44.0
VBURGCAN	1871-1888, 1890-1978				42.0
BISSELPT	1880-1884, 1887-1965				98.0
ENGDEPOT	1894-1978				29.0
JEFFBARR	1892-1907, 1926-1978				26.0

(Continued)

[1] 1974, months 9-12, contain all zeros.
[14] Very intermittent discharge data.
[15] Very intermittent stage and discharge data.

Table A2 (Concluded)

File Name	Stage Data Only	Stage and Discharge Data	Discharge Data Only	Data Contain All Zeros	Bankfull Stage
BRICKEY	1891-1900, 1904-1907, 1926-1978				26.0
LITROCKL	1891-1978				163.0
REDROCKL	1898-1907, 1926-1978				31.0
GRDTOWER	1885-1928, 1929-1968, 1969-1978				28.0
MOCSPRGS	1896-1907, 1926-1978				28.0
CPGIRARD	1896-1978				32.0
GRAYSPT	1878-1978				25.0
CNTROCK	1939-1978				
COMMERCE	1896-1978				24.0
PRICELND	1933-1947, 1950-1978				24.0
THOMPSON	1933-1978				319.0
BEECHRDG	1901-1917, 1926-1951				34.0

Table A3

File Names for Dike, Levee, and Revetment Files

Subcatalog		
DIKES	LEVEES	REVETS
DIK01	LEVEC1	REVET1
DIK02	LEVE01	REVET2
DIK03	LEVE02	REVET3
DIK04	LEVE03	REVET4
DIK05	LEVE04	REVET5
DIK06	LEVE05	REVET6
DIK07	LEVE06	REVET7
DIK08	LEVE07	REVET8
DIK09		REVET9
DIK10		
DIK11		
DIK12		
DIK13		
DIK14		

Table A4

Format of Dike Initialization Records

Record	Inclusive Column No(s).	Data Type*	Data Description
1	1 to 18	A-N	Dike name
	9 to 14	A-N	River mile
	15	A	Side of bank
	16	A	Mile system used
	17	N	Corps District
	18	A	Sub-District
	19	A	River
	20	A	Chute or side channel
	21	A	Type of dike
	22 to 25	N	Construction date
	26	A	Source of information
	27 to 31	N	Construction cost
	32	A	Dike function
	33	A	Model test (Y or N)
	34	A	Theory design (Y or N)
	35	A	Type of reach
	36	N	Datum of ALWP
	37	A	Principal material
	38 to 45	N	River end coordinate
	46 to 53	N	Land end coordinate
	54 to 58	N	Elevation of ALWP
	59	A	Type of opposite bank
	60 to 72	B	
	73 to 74	A	Flag = 'DI'
	75	B	

(Continued)

* A-N denotes alphanumeric; A, alphabetic; N, numeric; and B, blank.

Table A4 (Continued)

Record	Inclusive Column No(s).	Data Type	Data Description
1	76	A	Sort field
	77 to 80	N	Sort field
2	1 to 6	B	
	7 to 12	N	Width at ALWP before construction
	13 to 18	N	Width at ALWP after construction
	19 to 24	B	
	25 to 30	N	Width at top before construction
	31 to 36	N	Width at top after construction
	37 to 42	N	Distance to nearest channel cross section
	43 to 48	A-N	Cross-sectional system
	49 to 54	N	Distance to nearest valley cross section
	55 to 60	A-N	Cross-sectional system
	61 to 66	N	Dike length
	67 to 72	N	Perpendicular dike length
	73 to 74	A	Flag = 'DI'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
3	1 to 5	N	River end height above ALWP
	6 to 10	N	Height above ALWP
	11 to 15	N	Height above ALWP
	16 to 20	N	Height above ALWP
	21 to 25	N	Height above ALWP
	26 to 30	N	Height above ALWP
	31 to 35	N	Height above ALWP
3	36 to 40	N	Distance from river end
	41 to 45	N	Distance from river end

(Continued)

Table A4 (Concluded)

Record	Inclusive Column No(s).	Data Type	Data Description
3	46 to 50	N	Distance from river end
	51 to 60	N	Distance from river end
	61 to 65	N	Distance from river end
	66 to 70	N	Land end height above ALWP
	71 to 72	B	
	73 to 74	A	Flag = 'DI'
	75	B	
	76	A	Sort fields
	77 to 80	N	Sort fields

Table A5

Format of Dike Modification Records

Record	Inclusive Column No(s).	Data Type	Data Description
1	1 to 20	N/A	Same as first DI card
	21 to 24	N	Modification date
	25 to 27	A	Purpose of modification
	28 to 30	A	Source of information
	31 to 35	N	Cost
	36 to 38	A	Type of modification
	39 to 41	A	Extent of modification
	42	A	Principal material used
	43 to 50	N	River end coordinates
	51 to 58	N	Land end coordinates
	59 to 63	N	Aperature length
	64 to 72	B	
	73 to 74	A	Flag = 'DM'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
2	1 to 6	B	
	7 to 12	N	Clear width at ALWP
	13 to 18	N	Clear width at top
	19 to 24	N	Revised length
	25 to 30	N	Perpendicular revised length
	31 to 72	B	
	73 to 74	A	Flag - 'DM'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

(Continued)

Table A5 (Concluded)

Record	Inclusive Column No(s).	Data Type	Data Description
3	1 to 5	N	Height above ALWP river end
	6 to 10	N	Height above ALWP
	11 to 15	N	Height above ALWP
	16 to 20	N	Height above ALWP
	21 to 25	N	Height above ALWP
	26 to 30	N	Height above ALWP
	31 to 35	N	Height above ALWP
	36 to 40	N	Distance from river end
	41 to 45	N	Distance from river end
	46 to 50	N	Distance from river end
	51 to 55	N	Distance from river end
	56 to 60	N	Distance from river end
	61 to 65	N	Distance from river end
	66 to 70	N	Height above ALWP land end
	71 to 72	B	
	73 to 74	A	Flag = 'DM'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A6

Format of Dike Summary Records

Record	Inclusive Column No(s).	Data Type	Data Description
1	1 to 20	N/A	Same as first DI and DM cards
	21 to 23	A	Current status
	24 to 27	N	Date of report
	28 to 29	N	% of length covered by sediment
	30 to 33	N	Date abandoned
	34 to 36	A	Reason for abandonment
	37 to 46	B	
	47	A	Remark flag
	48 to 72	A-N	Remarks
	73 to 74	A	Flag = 'DS'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A7

Format of Levee Initialization Records

Record	Inclusive Column No(s).	Data Type	Data Description
1	1	A	Levee unit name
	2 to 9	N	Levee unit number
	10	A	Side of river
	11	A	River
	12	A	Tributary
	13	N	Corps District
	14 to 17	N	Date of initial construction
	18	A	Source of information
	19 to 24	N	Cost
	25	A	Initial purpose
	26	A	Data form identification
	27 to 32	N	Mile lower end
	33 to 38	N	Mile upper end
	39	A	Mileage system used
	40 to 45	N	Top elevation of lower end
	46 to 51	N	Top elevation of upper end
	52 to 72	B	
	1 to 8	N	Coordinates of lower end
	9 to 16	N	Time of construction
	17 to 24	N	Coordinates of upper end
	25 to 32	N	Time of construction
	33 to 36	A	Type of area protected
	37 to 40	N	Size of area protected
2	41	A	Type of levee
	42 to 45	N	Length Type A (earth)
	46 to 49	N	Length Type B (floodwall)
	50 to 53	N	Length Type C (other)

(Continued)

Table A7 (Continued)

Record	Inclusive Column No(s).	Data Type	Data Description
2	54 to 73	B	
	74 to 75	A	Flag = 'LI'
	76	A	Sort field
	77 to 80	N	Sort field
3	1 to 6	N	Mile (location)
	7 to 14	N	Levee station
	15 to 18	N	Height of levee
	19 to 24	N	Top elevation of levee
	25 to 30	N	Mile (location)
	31 to 38	N	Levee station
	39 to 42	N	Height of levee
	43 to 48	N	Top elevation of levee
	49 to 54	N	Mile (location)
	55 to 62	N	Levee station
	63 to 66	N	Height of levee
	67 to 72	N	Top elevation of levee
	73	B	
	74 to 75	A	Flag = 'LI'
	76	A	Sort field
	77 to 80	N	Sort field
4			Same as record #3
5			Same as record #3

(Continued)

Table A7 (Continued)

Record	Inclusive Column No(s).	Data Type	Data Description
NOTE:	Numerals in the right hand column indicate the following text:		
	1 = Distance of levee to top bank		
	2 = Mile (location)		
	3 = Station number		
	4 = Distance of levee to opposite bank		
	5 = Distance of levee to opposite levee or bluff		
6	1 to 6	N	1
	7 to 12	N	2
	13 to 20	N	3
	21 to 26	N	1
	27 to 32	N	2
	33 to 40	N	3
	41 to 46	N	1
	47 to 52	N	2
	53 to 60	N	3
	61 to 73	B	
	74 to 75	A	Flag = 'LI'
	76	A	Sort field
	77 to 80	N	Sort field
7			Same as record #6
8			Same as record #6
9	1 to 6	N	4
	7 to 12	N	2
	13 to 20	N	3
	21 to 26	N	4
	27 to 32	N	2

(Continued)

Table A7 (Concluded)

Record	Inclusive Column No(s).	Data Type	Data Description
9	33 to 40	N	3
	41 to 46	N	4
	47 to 52	N	2
	53 to 60	N	3
	61 to 73	B	
	74 to 75	A	Flag = 'LI'
	76	A	Sort field
	77 to 80	N	Sort field
10			Same as record #9
11			Same as record #9
12	1 to 6	N	5
	7 to 12	N	2
	13 to 20	N	3
	21 to 26	N	5
	27 to 32	N	2
	33 to 40	N	3
	41 to 46	N	5
	47 to 52	N	2
	53 to 60	N	3
	61 to 73	B	
	74 to 75	A	Flag = 'LI'
	76	A	Sort field
	77 to 80	N	Sort field
13			Same as record #12
14			Same as record #12

Table A8

Format of Levee Modification Records

Record	Inclusive Column No(s).	Data Type	Data Description
1	1	A	Levee unit name
	2 to 9	A	Levee unit number
	10 to 13	N	Date of initial construction
	14	A	River
	15	A	System used
	16	N	Corps District
	17	A	Purpose of modification
	18	A	Source of information
	19 to 23	N	Cost
	24	A	Type of repair
	25	A	Extent of modification
	26	A	Material used
	27 to 32	N	Mileage at lower end
	33 to 38	N	Mileage at upper end
	39	A	Mileage system used
	40 to 73	B	
	74 to 75	A	Flag = 'LM'
	76	A	Sort field
	77 to 80	N	Sort field
2	1 to 6	N	Mile
	7 to 14	N	Station number
	15 to 18	N	Height of levee
	19 to 24	N	Elevation of levee
	25 to 30	N	Mile
	31 to 38	N	Station number
	39 to 42	N	Height of levee
	43 to 48	N	Elevation of levee

(Continued)

Table A8 (Concluded)

Record	Inclusive Column No(s).	Data Type	Data Description
2	49 to 54	N	Mile
	55 to 62	N	Station number
	63 to 66	N	Height of levee
	67 to 72	N	Elevation of levee
	73	B	
	74 to 75	A	Flag = 'LM'
	76	A	Sort field
	77 to 80	N	Sort field
3			Same as record #2
4			Same as record #2

Table A9

Format of Revetment Initialization Records

Record	Inclusive Column No(s).	Data Type	Data Description
1	1 to 8	A-N	First 8 letters of revetment name
	9	A	Code for river name
	10	N	Code for Corps District
	11 to 14	A	Code for mattress type
	15 to 18	N	Date of initial construction
	19 to 22	A	Code for data source
	23 to 28	N	Cost of initial construction in 1000's of dollars
	29 to 32	A	Code for initial purpose
	33 to 38	N	River mile of lower end
	39 to 44	N	River mile of upper end
	45 to 72	B	
	73 to 74	A	Flag = 'RI'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
2	1	A	Code for side of river
	2	A	Code for type of reach
	3 to 8	N	Lower end mile at time of construction
	9	B	
	10 to 15	B	
	16 to 19	B	
	20	B	
	21 to 28	N	N-S coordinate of lower end
	29 to 36	N	E-W coordinate of lower end
	37 to 42	N	Upper end mile at time of construction
	43	B	
	44 to 49	B	

(Continued)

Table A9 (Concluded)

Record	Inclusive Column No(s).	Data Type	Data Description
2	50 to 53	B	
	54	B	
	55 to 62	N	N-S coordinate of upper end
	63 to 70	N	E-W coordinate of upper end
	71 to 72	B	
	73 to 74	A	Flag = 'RI'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A10

Format of Revetment Modification Records

Record	Inclusive Column No(s).	Data Type	Data Description
3	1 to 8	A-N	First 8 letters of revetment name
	9	A	Code for river name
	10 to 13	N	Date of modification
	14	A	Purpose of modification or repair
	15	A	Source of information
	16 to 21	N	Cost of modification or repair in 1000's of dollars
	22	A	Type of modification or repair
	23	A	Extent of modification or repair
	24	A	Principal material used
	25 to 32	B	
	33 to 40	B	
	41 to 48	B	
	49 to 56	B	
	57 to 62	N	Linear feet of revetment modified or repaired
	63 to 72	B	
	73 to 74	A	Flag = 'RM'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A11

Format of Revetment Physical Data Records

Record	Inclusive Column No(s).	Data Type	Data Description
4	1 to 8	A-N	First 8 letters of revetment name
	9 to 14	N	River mile at section
	15 to 20	A-N	Revetment station number
	21 to 25	N	Height above CRP
	26 to 30	N	Distance below CRP
	31 to 36	N	Elevation of CRP
	37 to 42	N	Clear width at CRP
	43 to 48	N	Clear width at top of bank
	49 to 56	N	N-S coordinates of section
	57 to 64	N	E-W coordinates of section
	65 to 72	B	
	73 to 74	A	Flag = 'RP'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A12

Format of Revetment Summary Records

Record	Inclusive Column No(s).	Data Type	Data Description
5	1 to 8	A-N	First 8 letters of revetment name
	9	A	Code for all active
	10	A	Code for partially active
	11	A	Code for inactive
	12 to 56	B	
	57	A	Code for current status
	58 to 72	B	
	73 to 74	A	Flag = 'RS'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
6	1 to 72	B	
	73 to 74	A	Flag = 'RS'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A13

Format of St. Louis District Revetment Initialization Records

Record	Inclusive Column No(s).	Data Type	Data Description
1	1 to 8	A	Revetment name
	9	A	Code for river name
	10	N	Code for Corps District
	11 to 14	A	Code for mattress type
	15 to 18	N	Date of initial construction
	19 to 22	A	Code for data source
	23 to 28	N	Cost in 1000's of dollars
	29 to 32	A	Code for initial function
	33 to 38	N	River mile of lower end
	39 to 44	N	River mile of upper end
	45 to 72	B	
	73 to 74	A	Flag = 'RI'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
2	1	A	Code for side of river
	2	A	Code for type of reach
	3 to 8	N	Lower end river mile at time of construction
	9	A	Code for above river mile system
	10 to 20	B	
	21 to 36	N	Initial lower end coordinates
	37 to 42	N	Upper end river mile at time of construction
	43	A	Code for above river mile system
	44 to 54	B	
	55 to 70	N	Upper end initial coordinates
	73 to 74	A	Flag = 'RI'

(Continued)

Table A13 (Continued)

Record	Inclusive Column No(s).	Data Type	Data Description
2	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
3	1 to 8	A	Revetment name
	9	N	Code for Corps District
	10	A	Code for mattress type
	11 to 15	N	Mattress length in 1000's of feet
	16 to 20	N	Elevation of mattress toe
	21 to 25	N	Elevation of mattress top
	26 to 30	A	Gage or CRP
	31 to 40	N	Mattress station numbers
	41	A	Code for upper bank paving type
	42 to 46	N	Length of paving in 1000's of feet
	47 to 51	N	Elevation of top of paving
	52 to 56	N	1000's of square feet of paving
	57 to 61	A-N	Gage or CRP
	62 to 71	N	Station numbers for upper bank paving
	73 to 74	A	Flag = 'R1'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
4	1 to 5	N	Length of rock revetment
	6 to 10	N	Cubic yards of stone
	11 to 15	N	Square feet of stone placed
	16 to 20	N	Elevation of toe
	21 to 25	N	Elevation of top
	26 to 30	A-N	Gage or CRP
	31 to 35	N	Clear width at ALWP

(Continued)

Table A13 (Concluded)

Record	Field	Data Type	Data Description
		P	
		A	Flag = 'RI'
		B	
		N	Sort field
		N	Sort field
		N	Clear width at bank top
		N	Elevation of ALWP
		N	Feet from upper end
		N	Clear width at ALWP
		N	Clear width at bank top
		N	Elevation of ALWP
		N	Feet from upper end
		N	Clear width at ALWP
		N	Clear width at bank top
		N	Elevation of ALWP
		N	Clear width at ALWP
		N	Clear width at bank top
		N	Elevation of ALWP
		P	
		A	Flag = 'RI'
		B	
		A	
		N	

Table A14

Format of St. Louis District Revetment Repair Records

Record	Inclusive Column No(s).	Data Type	Data Description
6	1 to 8	A	Revetment name
	9	N	Code for Corps District
	10 to 13	N	Date
	14	A	Code for purpose of repair
	15	A	Code for type of repair
	16	A	Code for reason for repair
	17 to 21	N	Station number
	22 to 26	N	Length in 1000's of feet
	27 to 42	N	Coordinates
	43 to 47	N	Area in 1000's of square feet
	48	A	Code for principal material
	49 to 53	A-N	Amount of material
	54 to 58	N	Cost in 1000's of dollars
	59 to 63	N	Station number
	64 to 72	B	
	73 to 74	A	Flag = 'RR'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A15

Format of St. Louis District Revetment Modification Records

Record	Inclusive Column No(s).	Data Type	Data Description
7	1 to 8	A	Revetment name
	9	N	Code for Corps District
	10 to 13	N	Date of modification
	14	A	Code for purpose of repair
	15	A	Code for type of modification
	16 to 20	N	New elevation toe
	21 to 25	N	New elevation top
	26 to 30	A-N	Gage or ALWP
	31 to 35	N	Length of modification
	36 to 40	N	Width of modification
	41 to 45	N	Station number
	46	A	Code for type of material used
	47 to 51	A-N	Amount of material used
	52 to 56	N	Cost of modification in 1000's of dollars
	57 to 72	B	
	73 to 74	A	Flag = 'RM'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A16

Format of St. Louis District Revetment Extension Records

Record	Inclusive Column No(s).	Data Type	Data Description
8	1 to 8	A	Revetment name
	9	N	Code for Corps District
	10 to 13	N	Date
	14	A	Code for purpose of extension
	15 to 19	N	Length extended in 1000's of feet
	20 to 35	N	Upper end coordinates
	36 to 40	N	River mile at upper end at construction
	41	A	Code for above river mile system
	42 to 46	N	Present river mile at upper end
	47	A	Code for type of mattress
	48 to 52	N	Length of mattress in 1000's of feet
	53 to 57	N	Width of mattress
	58 to 62	N	Elevation of toe of mattress
	63 to 67	N	Elevation of top of mattress
	68 to 72	A-N	Gage or ALWP
	73 to 74	A	Flag = 'RE'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
9	1	A	Code for type of upper bank paving
	2 to 6	N	Length of paving in 1000's of feet
	7 to 11	A-N	Elevation of top of paving
	12 to 16	A-N	Gage or ALWP
	17 to 21	N	Length of stone revetment
	22 to 26	N	Cubic yards of stone placed
	27 to 31	N	1000's of square feet covered
	32 to 36	A-N	Elevation of toe

(Continued)

Table A16 (Concluded)

Record	Inclusive Column No(s).	Data Type	Data Description
9	37 to 41	A-N	Elevation of top
	42 to 46	A-N	Gage or ALWP
	47 to 51	N	Clear width at ALWP; revetment head
	52 to 56	N	Clear width at bank top; revetment head
	57 to 61	N	Clear width at ALWP; revetment tail
	62 to 66	N	Clear width at bank top; revetment tail
	67 to 72	B	
	73 to 74	A	Flag = 'RE'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
10	1 to 8	A	Revetment name
	9 to 15	B	
	16 to 21	N	River mile at lower end of extension
	22 to 24	B	
	25 to 40	N	Coordinates at lower end of extension
	41 to 72	B	
	73 to 74	A	Flag = 'RE'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A17

Format of St. Louis District Revetment Physical (RP) Records

Record	Inclusive Column No(s).	Data Type	Data Description
11	1 to 8	A	Revetment name
	7 to 14	N	Station river mile
	15 to 20	N	Station number
	21 to 30	B	
	31 to 36	N	Elevation of ALWP
	37 to 42	N	Clear width at ALWP
	43 to 48	N	Clear width at bank top
	49 to 64	A-N	Station coordinates
	65 to 72	B	
	73 to 74	A	Flag = 'RP'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Table A18

Format of St. Louis District Revetment Summary Records

Record	Inclusive Column No(s).	Data Type	Data Description
12	1 to 8	A	Revetment name
	9	A	If Y then all active
	10	A	If Y then partially active
	11	A	If Y then inactive
	12 to 17	N	Lower end river mile
	18 to 23	N	Lower end station number
	24 to 29	N	Upper end river mile
	30 to 35	N	Upper end station number
	36 to 72	B	
	73 to 74	A	Flag = 'RS'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field
13	1 to 56	B	
	57	A	Code for reason why inactive
	58 to 61	N	Date for inactive
	62 to 72	B	
	73 to 74	A	Flag = 'RS'
	75	B	
	76	A	Sort field
	77 to 80	N	Sort field

Appendix B: Maintenance/Update Programs

1. The programs described in this appendix are primarily for maintaining and updating the data base at periodic intervals. All of them are used by the PODAPS manager in performing the maintenance and update tasks, with the exception of the daily input program, PUØ1A. Since the data collected using this program eventually become a permanent part of the data base, it is considered an update program and included in this appendix. The programs described below are PUØ1A, PUØ1B, PSØ1, and PLØ1.

PUØ1A

2. PUØ1A is designed to accept daily gage data from the user and store them in a CURRENT YEAR file for later use. Input data items are:

a. Gage identification number.

b. Stage reading to the nearest tenth of a foot.

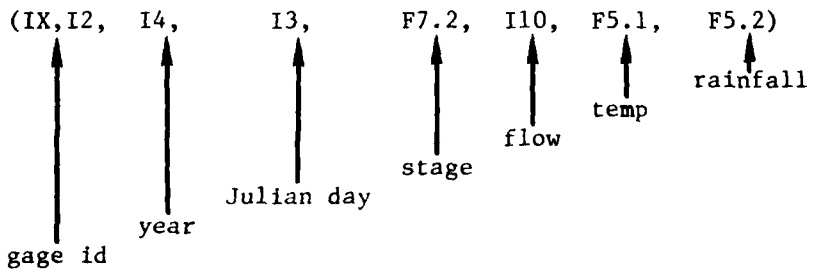
c. Flow or discharge in 1000's of cubic feet per second.

d. Temperature in degrees C.

e. Rainfall in hundredths of inches.

The data is obtained from the computer by using the system data routine. This date is converted and stored as a 4-digit year and 3-digit Julian day combination.

3. Record format for the data as stored on the CURRENT YEAR file is:



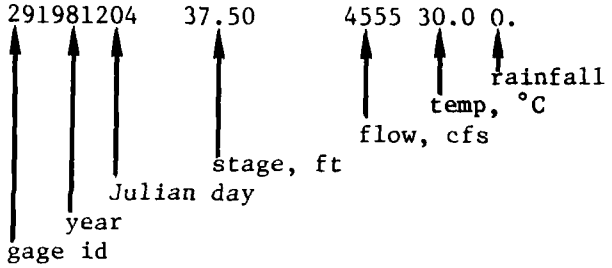
A sample execution appears as follows:

```
 WOULD YOU LIKE A TABLE OF THE GAGES AND
 THEIR GAGE ID NUMBERS PRINTED?
 (Y OR N)
*N

 THE FOLLOWING IS A LIST OF EACH GAGE AVAILABLE
   AND ITS SELECTION NUMBER:

 1 - ALEXANDRIA          19 - GRAYS POINT         37 - PINE BLUFF
 2 - ALTON               20 - GREENVILLE          38 - PRICE LANDING
 3 - ARKANSAS CITY       21 - GREENWOOD           39 - RED RIVER
 4 - BATON ROUGE         22 - HELENA              40 - RED ROCK LANDING
 5 - BEECHBRIDGE         23 - HERMANN             41 - REDWOOD
 6 - BELZONI             24 - HICKMAN             42 - ROSEDALE
 7 - BISSEL POINT        25 - JEFFERSON BARRACKS  43 - ST. JOSEPH
 8 - BRICKEY             26 - KEOKUK              44 - ST. LOUIS
 9 - CAIRO               27 - LAKE PROVIDENCE     45 - SELMA
10 - CAPE GIRARDEAU      28 - LITTLE ROCK         46 - SIMMESPORT
11 - CARUTHERSVILLE      29 - LITTLE ROCK LANDING 47 - THEBES
12 - CHESTER             30 - MEMPHIS             48 - THOMPSON LANDING
13 - CLARENDON           31 - MEREDOSIA           49 - VICKSBURG
14 - COMMERCE            32 - METROPOLIS          50 - VICKSBURG CANAL
15 - COUNTERFEIT ROCK    33 - MOCCASIN SPRINGS    51 - WARFIELD POINT
16 - ENGINEER DEPOT      34 - NATCHEZ             52 - WHITE RIVER
17 - FULTON              35 - NEW MADRID
18 - GRAND TOWER         36 - PADUCAH

  INPUT GAGE SELECTION NUMBER.
=36
INPUT STAGE,FLOW,TEMPERATURE,AND RAINFALL SEPARATED
BY COMMAS OR BLANKS IN THE PRECEEDING ORDER
=26.5,4567,31.,0.0
DO YOU HAVE MORE INPUT? Y OR N
*Y

  INPUT GAGE SELECTION NUMBER.
=29
INPUT STAGE,FLOW,TEMPERATURE,AND RAINFALL SEPARATED
BY COMMAS OR BLANKS IN THE PRECEEDING ORDER
=30.,,4230.,30.,,,,0
DO YOU HAVE MORE INPUT? Y OR N
*N
```

Note: The above example shows two gages selected for input. Gage data for each one are written to the current year file ("CURRYR") which is listed below:

*LIST CURRYR

```
361981204    36.50       4567 31.0 0.
291981204    37.50       4555 30.0 0.
```



A run for the next day is shown below along with the "CURRYR" file as updated:

```
  WOULD YOU LIKE A TABLE OF THE GAGES AND
  THEIR GAGE ID NUMBERS PRINTED?
  (Y/N)
=N

  INPUT GAGE SELECTION NUMBER.
=24
INPUT STAGE,FLOW,TEMPERATURE,AND RAINFALL SEPARATED
BY COMMAS OR BLANKS IN THE PRECEEDING ORDER
=31.2,4580,0
=0
DO YOU HAVE MORE INPUT? Y OR N
=N

*LIST CURRYR

 361981204  36.50       4567 31.0 0.
 291981204  37.50       4555 30.0 0.
 241981204  31.20       4580  0.  0.
```

PUØ1B

4. Program PUØ1B is an annual update program for adding the data in the "CURRENT YEAR" file to the various gage files of the data base. Its basic operations are to:

a. Sort the CURRENT YEAR file by gage identification code and date.

b. Attach each gage file as identified by the update record identification codes.

c. Add the current year data to the end of the gage master file.

d. Detach the gage master file and continue these steps until all current year data have been added.

5. The excecution file contains the following commands:

```
10$:IDENT:AODPLMVD,ENETE
20$:USERID:AODPLMVD$password
30$:OPTION:FORTRAN
40$:SELECT:AODPLMVD/LMVLIB/PUØ1B,R
50$:EXECUTE:DUMP
60$:LIMITS:3Ø,3ØK,,2K
70$:TAPE9:Ø2,X1D
80$:FFILE:Ø1,MLTF1L
90$:MSG2:SAVE Ø2,ENETE, AODPLMVD,DB-UPDATE
100$:ENDJOB
```

PSØ1

6. PSØ1 is a utility copy program that copies all data and program files to tape for backup purposes in the event of system malfunction. This program is executed at the option of the PODAPS manager. It consists entirely of job control language statements as follows:

```
10$:IDENT:AODPLMVD,ENETE
20$:USERID:AODPLMVD$password
30$:FILSYS
40$:TAPE9:PS,X1D
50$:MSG2:SAVE PS,ENETE,AODPLMVD,BACK-UP-PODAPS
60:USERID AODPLMVD$password
70:SAVE AODPLMVD/catalog,LISTOPT/YES/
80$:ENDJOB
```

PLØ1

7. PLØ1 performs the tasks of reloading the data base to disk after being updated by PUØ1B. It replaces all the gage station files with those from the tape which include the newly added current year data. Upon successful completion of this operation, the data in the CURRENT YEAR file are placed on tape for retention purposes for 3 months, after which the tape is released. The disk file is erased and made ready for the next year's data.

8. Execution of PLØ1 is in batch mode using the following commands:

```
10$:IDENT:AODPLMVD,ENETE
20$:USERID:AODPLMVD$password
30$:OPTION:FORTRAN
40$:SELECT:AODPLMVD/LMVLIB/PLØ1
50$:EXECUTE:DUMP
```

```
60$:TAPE9:01,X1D,,tape no.
70$:FFILE:01,MLTF1L
80$:ENDJOB
```

Appendix C: Gage Station Analysis and Display Programs

1. Various programs have been written to perform a variety of statistical analyses and displays of the gage station data. The programs described below are currently included in PODAPS to perform user-requested analyses and displays. Each is discussed in terms of purpose, methodology, and execution. The programs are:

a. P111A. Analysis of current year data.

b. P222A. Comparison analysis.

c. P331B. Preliminary statistics.

d. P332B. Histograms.

e. P333B. Recurrence interval statistics.

f. P400A. Hydrograph plots.

P111A

2. Purpose. P111A is a subprogram of the driver program GMAIN. GMAIN's operation is described below in paragraph 5. P111A allows the user to tabulate, analyze, and display selected data in a variety of forms. It gives the user an opportunity to perform several of these functions in one execution.

3. Methodology. The program computes maximum, minimum, and average values for stage and discharge. These values are derived using standard computer algorithms for maximums and minimums and the following for averages:

$$\bar{X}_s = \frac{1}{n} \sum_{i=1}^{n} s_i \; ; \quad \bar{X}_F = \frac{1}{n} \sum_{i=1}^{n} f_i$$

where

$\bar{X}_s$ = mean for stage

$\bar{X}_F$ = mean for flow

n = number of points; corresponds to the number of days in the period of time selected

s_i = ith stage value

f_i = ith flow reading

4. For tabulated results, the data for the selected time period are listed with no computations performed. In providing the plotted results, the raw data are scaled for the type plot to be produced. This task is done in the code and is based upon the type plot produced. A "printer" plot is produced for the user without the graphics on a CRT-type terminal; i.e., a plot is made that uses the printer of the terminal to draw the plot.

5. Execution. Two methods of executing GMAIN are available, and the proper one to use is based upon the type of terminal available to the user. The first method works in all cases but is more expensive due to the software overhead costs of the graphics code, which is the two-dimensional Graphics Compatibility System (GCS2D). Hence, method two should be used if a graphics terminal is not required.

a. Method one:

```
SYSTEM FORT N
READY
•GCS2D GMAIN
device=TK4

        07/30/81     13.250

FOLLOWING IS A LIST OF OPTIONS AVAILABLE FOR DATA INPUT AND RETRIEVAL.

          1---INPUT AND STORE GAGE DATA ON A
              DAILY BASIS
          2---SELECT AND DISPLAY A PERIOD OF
              GAGE DATA FROM CURRENT YEAR
          3---COMPARE CURRENT VS. HISTORY
              YEAR GAGE DATA

USER ENTER NUMBER OF DESIRED OPTION: ?
```

b. Method two:

```
•RUN GMAIN
FOLLOWING IS A LIST OF OPTIONS AVAILABLE FOR DATA INPUT AND RETRIEVAL.

          1---INPUT AND STORE GAGE DATA ON A
              DAILY BASIS
          2---SELECT AND DISPLAY A PERIOD OF
              GAGE DATA FROM CURRENT YEAR
          3---COMPARE CURRENT VS. HISTORY
              YEAR GAGE DATA

USER ENTER NUMBER OF DESIRED OPTION: ?
```

The only difference in the two options is in the RUN command. If method two is used, the user cannot obtain graphic (CRT) display of the plots.

6. A user response to the last request of "2" calls in sub-program P111A which issues the following requests:

```
WOULD YOU LIKE A TABLE OF THE GAGES AND
THEIR GAGE ID NUMBERS PRINTED?
(Y/N) ?
```

A "Y" response generates the following list of gage selection codes and names:

```
  THE FOLLOWING IS A LIST OF EACH GAGE AVAILABLE
    AND ITS SELECTION NUMBER:

 1 - ALEXANDRIA          19 - GRAYS POINT         37 - PINE BLUFF
 2 - ALTON               20 - GREENVILLE          38 - PRICE LANDING
 3 - ARKANSAS CITY       21 - GREENWOOD           39 - RED RIVER
 4 - BATON ROUGE         22 - HELENA              40 - RED ROCK LANDING
 5 - BEECHRIDGE          23 - HERMANN             41 - REDWOOD
 6 - BELZONI             24 - HICKMAN             42 - ROSEDALE
 7 - BISSEL POINT        25 - JEFFERSON BARRACKS  43 - ST. JOSEPH
 8 - BRICKEY             26 - KEOKUK              44 - ST. LOUIS
 9 - CAIRO               27 - LAKE PROVIDENCE     45 - SELMA
10 - CAPE GIRARDEAU      28 - LITTLE ROCK         46 - SIMMESPORT
11 - CARUTHERSVILLE      29 - LITTLE ROCK LANDING 47 - THEBES
12 - CHESTER             30 - MEMPHIS             48 - THOMPSON LANDING
13 - CLARENDON           31 - MEREDOSIA           49 - VICKSBURG
14 - COMMERCE            32 - METROPOLIS          50 - VICKSBURG CANAL
15 - COUNTERFEIT ROCK    33 - MOCCASIN SPRINGS    51 - WARFIELD POINT
16 - ENGINEER DEPOT      34 - NATCHEZ             52 - WHITE RIVER
17 - FULTON              35 - NEW MADRID
18 - GRAND TOWER         36 - PADUCAH
```

An "N" response bypasses th.. .ist and takes the user to the next sequence of questions. These ask the user for the gage selection number, dates of the selection period, and desired output:

```
INPUT GAGE SELECTION NUMBER. ? 36

INPUT INITIAL AND FINAL DATES FOR THE DESIRED PERIOD OF TIME.
  DATES SHOULD BE 3 LETTERS AND 2 DIGITS (EX. - FEB03,JUL26) ? JUL23,JUL28


THE FOLLOWING OPTIONS ARE AVAILABLE THROUGH THIS PROGRAM.
   1 - TABLE OF OUTPUT DATA.
   2 - GDS PLOTS OF OUTPUT DATA.
   3 - TERMINAL PLOT OF OUTPUT DATA.
   4 - STATISTICAL COMPARISON OF OUTPUT DATA.


INDICATE WHICH OF THE FOUR OPTIONS ARE DESIRED.
(OPTION1,OPTION2,OPTION3,OPTION4)?  (0-NO;1-YES) ? 1,0,1,1
```

7. The results of these selections are shown in the following samples:

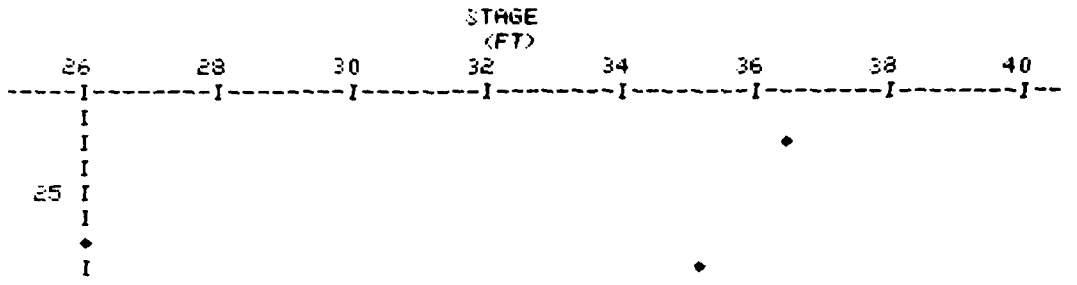
a. Table:

1981 TABULATED LISTING OF GAGE DATA
FOR GAGE: PADUCAH
DURING THE TIME: JUL23 - JUL28

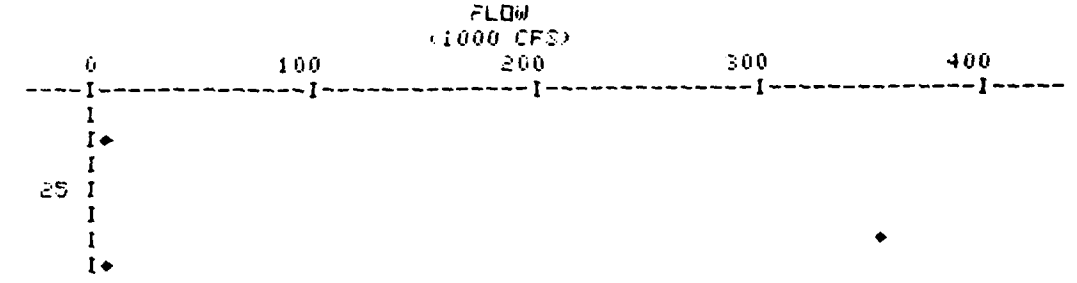
DATE	STAGE (FT)	FLOW (1000 CFS)	TEMPERATURE (C)	RAINFALL (IN)
JUL23	36.5	5.	31.0	0.
JUL27	26.0	356.	26.0	3.00
JUL28	35.0	3.	31.0	0.
JUL28	39.0	47.	25.0	2.10

b. Plots:

1981 2-D (DATE,STAGE) PLOT
FOR GAGE: PADUCAH
DURING THE TIME: JUL23 - JUL28



1981 2-D (DATE,FLOW) PLOT
FOR GAGE: PADUCAH
DURING THE TIME: JUL23 - JUL28



c. Statistical comparison:

1981 STATISTICAL COMPARISON OF GAGE DATA
FOR GAGE: PADUCAH
DURING THE TIME: JUL23 - JUL28

	STAGE (FT)	FLOW (1000 CFS)	TEMPERATURE (C)	RAINFALL (IN)
MAXIMUM	39.0	356.	31.0	3.00
MINIMUM	26.0	3.	25.0	0.
AVERAGE	34.1	103.	28.3	1.28

8. Next, the user is asked if he wants to continue.

```
WOULD YOU LIKE TO SELECT ANOTHER OPTION (Y OR N) ? N
```

A "Y" response returns him to the original set of requests in paragraph 5. An "N" response terminates execution.

P222A

9. Purpose. P222A provides for comparisons of selected time periods and selected gage stations. It also is a subprogram of "GMAIN" and is option 3 of the menu GMAIN presents to the user (paragraph 5). By providing data presentation similar to P111A, the user may obtain a fast look at the selected data for use in his studies, forecasts, etc.

10. Methodology. P222A computes statistics and prepares plots in a manner similar to P111A, but for two periods or two stations such that the user may select (a) one station and two different time periods or (b) the same time period for two different stations. The station(s) may be any of the 52 master gages and/or the CURRENT YEAR file. Time periods may cross over into the next year; however, the total length of any one time period must be equal to or less than 1 year.

11. Statistics generated are maximums, minimums, and means for stage and flow and are derived using the same algorithms as P111A.

12. Execution. The user must execute "GMAIN" to use P222A. After the user selects option 3 (paragraph 5), the following response is displayed:

```
SORRY, THIS OPTION IS NOT COMPLETED. EXPECTED DATE IS
   15 AUGUST 81
```

P331B

13. Purpose. P331B provides the user detailed statistics covering the entire time period recorded for the selected master file. Specifically, these are maximums, minimums, and dates of occurrence for stage and flow for each year of record.

14. Methodology. P331B was originally written by the University of Missouri at Rolla under contract with LMVD. The program is documented

in the manuals provided as part of that contract: "LMVD Potamology Study (T-1)" and "LMVD Potamology Study (T-1), Appendix 3.1 - Computer Program Listings."

15. Execution. The user logs on the computer using normal procedures. He accesses the program as follows:

```
*RUN AODPLMVD/RIVER/P331B,R
```

16. Upon initiation of execution, the program displays the following list:

```
*FRN -RIVER/P331B
USER:FOLLOWING IS A TABLE OF
     AVAILABLE FILES W/NUMBER CODES----

   1-ALEXANDRIA          2-ARKANSAS            3-CHESTER
   4-KEOKUK              5-PADUCAH             6-PEDRIVER
   7-ST.LOUIS            8-VICKSBURG           9-THEBES
   10-HELENA             11-HERMAN             12-SIMMSPORT
   13-MEREDOSI           14-LITTLE ROCK        15-METROPOLIS
   16-CLARENDON          17-ALTON              18-MEMPHIS
   19-HICKMAN            20-NATCHEZ            21-ST. JOSEPH
   22-GREENVILLE         23-SELMA              24-FULTON
   25-LAKE PROVIDENCE    26-BATON ROUGE
```

It then asks the user to select and input the number code of the desired file:

```
NOW INPUT THE NUMBER CODE FOR THE DESIRED FILE.
=8
```

Next, responses to questions pertaining to the report and gage are entered:

```
INPUT STARTING PAGE NUMBER FOR REPORT.
=1
INPUT STATION NAME, GAGE READING, RIVER MILE.
=VICKSB  3.43.0.275
```

17. When completed,the program computes the statistics in Figures C1 and C2 and writes other values to a formatted printer file.

MINIMUM AND MAXIMUM MEAN DAILY STAGE (FEET)

GAGE DATUM 43.00 RIVER MILE 275.00

YEAR	MAXSTAGE	DATE	MINSTAGE	DATE
1922	54.80	4/27	3.70	11/14
1926	40.80	10/25	8.60	1/ 9
1927	58.40	5/ 4	12.20	10/ 2
1929	55.20	6/ 6	9.40	10/ 6
1931	35.76	12/31	2.89	11/19
1932	50.23	2/28	5.00	10/23
1933	47.47	6/10	2.48	11/29
1934	34.51	4/13	1.64	8/18
1935	46.72	4/15	1.60	10/23
1936	42.52	4/30	-3.50	8/31
1937	53.17	2/21	-3.05	12/21
1938	40.38	4/26	-2.10	11/11
1939	42.60	3/30	-6.81	11/ 1
1940	33.64	5/11	-6.99	2/ 2
1941	26.94	11/14	-4.30	8/19
1942	34.38	4/27	2.24	1/23
1943	43.38	6/ 9	-2.54	12/31
1944	43.10	5/15	-2.54	1/ 1
1945	47.42	4/29	3.04	9/10
1946	38.77	1/27	-0.68	9/17
1947	37.00	5/ 7	-1.87	10/25
1948	39.69	4/17	-1.08	10/16
1949	40.30	2/20	2.60	12/ 2
1950	44.90	3/ 1	5.60	11/ 8
1951	36.10	3/11	6.90	10/27
1952	38.50	4/ 9	-2.30	11/12
1953	33.50	5/27	-4.30	11/26
1954	22.00	5/ 9	-3.90	9/23
1955	37.30	4/ 8	-3.20	12/31
1956	32.20	3/ 4	-5.60	1/28
1957	40.10	6/ 7	3.00	10/17
1958	38.40	5/22	-0.20	12/31
1959	29.30	3/ 1	-2.30	9/28
1960	35.00	4/23	0.05	11/ 5
1961	44.88	5/30	-0.20	2/10
1962	41.98	4/12	0.10	12/29
1963	38.16	4/ 6	-4.36	12/31
1964	36.38	4/ 3	-5.75	1/ 6
1965	38.65	4/23	1.95	9/ 2
1966	34.40	5/16	0.30	11/ 7
1967	34.10	5/30	3.20	9/19
1968	37.90	4/15	2.70	9/15
1969	40.60	2/19	5.40	10/14
1970	42.10	5/17	4.90	9/18
1971	39.00	3/14	3.80	10/21
1972	[illegible]	5/13	8.40	9/13
1973	[illegible]	5/14	0.	10/ 1
1974	44.20	[illegible]	6.70	10/17
1975	42.00	[illegible]	0.	9/28
1976	32.40	[illegible]	-0.10	9/30
1977	32.40	4/21	-0.80	2/14
1978	39.80	4/ 9	0.	1/19

Figure C1.

MINIMUM AND MAXIMUM MEAN DAILY FLOW(CFS)

YEAR	MAXFLOW	DATE	MINFLOW	DATE
1922	0	0/ 0	0	1/ 1
1926	0	0/ 0	0	1/ 1
1927	0	0/ 0	0	1/ 1
1929	1730000	6/ 6	196000	10/ 6
1931	824000	12/31	127000	11/19
1932	1410000	2/26	155000	9/25
1933	1360000	6/ 8	142000	11/29
1934	874000	4/11	142000	8/18
1935	1410000	4/14	138000	10/19
1936	1270000	4/27	101000	8/29
1937	2080000	2/17	141000	12/21
1938	1190000	4/22	157000	11/11
1939	1410000	3/ 9	100000	11/ 1
1940	1075000	5/ 9	110000	2/ 2
1941	940000	11/14	154000	8/19
1942	1169000	4/20	254000	11/ 4
1943	1643000	6/ 5	161000	12/31
1944	1609000	5/13	156000	1/ 1
1945	1922000	4/ 8	218000	9/ 9
1946	1481000	1/26	162000	10/17
1947	1301000	5/ 4	156000	10/18
1948	1396000	4/14	150000	10/ 8
1949	1562000	2/10	e12000	9/16
1950	1876000	2/23	248000	11/ 8
1951	1349000	3/11	285000	10/27
1952	1362000	4/10	132000	11/ 3
1953	983000	5/27	136000	11/24
1954	703000	5/ 9	146000	9/23
1955	1282000	4/ 7	143000	9/23
1956	1108000	3/ 3	128000	1/27
1957	1312000	6/ 7	230000	10/17
1958	1191000	5/16	198000	12/31
1959	977000	3/ 1	162000	9/28
1960	1100000	4/23	187000	11/ 5
1961	1578000	5/30	205000	2/10
1962	1435000	4/ 2	205000	12/23
1963	1334000	4/ 2	140000	11/ 3
1964	1267000	4/ 2	126000	1/ 8
1965	1284000	4/22	211000	9/ 1
1966	1105000	2/28	197000	11/ 7
1967	1035000	5/29	220000	9/19
1968	1158000	4/12	204000	9/14
1969	1404000	2/19	243000	10/14
1970	1304000	5/16	222000	9/19
1971	1317000	3/14	208000	10/20
1972	1251000	12/30	203000	9/17
1973	1962000	5/12	0	10/ 1
1974	1526000	2/ 9	289000	10/16
1975	1839000	4/12	303000	9/ 2
1976	1016000	3/ 7	170000	9/30
1977	995000	12/15	178000	8/14
1978	0	0/ 0	0	1/ 1

Figure C2.

Since this output occupies more line space than the terminal printer allows, it must be listed by the system printer. Below are the commands to have this file listed at the printer:

```
20      $       IDENT   A0DPLMVD,ENETE
30      $       USERID  A0DPLMVD$DP603
40      $       CONVER
50      $       LIMITS  ,,,10K
60      $       OUTPUT  MEDIA=03
70      $       PRMFL   IN,R,L,A0DPLMVD/RIVER/OUT331
80      $       SYSOUT  OT
90      $       ENDJOB
```

Samples of the output are shown on page C11.

VICKSBURG

STATION NUMBER 07289000
BANKFULL STAGE 43.00
DRAINAGE AREA 1140400

AVERAGE DAILY STAGE(FEET)

GAGE DATUM 43.00 RIVER MILE 275.00

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	14.91	20.20	25.82	31.28	32.64	26.40	20.46	13.26	7.58	6.16	6.32	10.70
2	15.15	20.34	25.95	31.46	32.63	26.03	20.36	13.03	7.34	6.20	6.25	10.80
3	15.47	20.58	26.05	31.65	32.58	25.66	20.24	12.77	7.14	6.28	6.19	10.86
4	15.82	20.85	26.14	31.89	32.49	25.29	20.11	12.44	7.04	6.36	6.15	10.88
5	16.23	21.18	26.25	32.02	32.43	24.90	19.99	12.10	7.00	6.77	6.18	10.89
6	16.60	21.49	26.39	32.18	32.39	24.52	19.83	11.76	6.96	6.91	6.20	10.95
7	16.93	21.74	26.54	32.36	32.32	24.16	19.64	11.42	6.89	7.01	6.25	11.01
8	17.22	21.91	26.64	32.52	32.16	23.81	19.46	11.08	6.86	7.05	6.37	11.02
9	17.49	22.07	26.75	32.65	31.95	23.53	19.24	10.78	6.84	7.10	6.64	11.04
10	17.78	22.19	26.91	32.78	31.66	23.30	18.95	10.54	6.80	7.12	7.03	11.06
11	18.09	22.26	27.19	32.92	31.34	23.08	18.70	10.32	6.73	7.11	7.49	11.16
12	18.46	22.33	27.32	33.06	31.00	22.89	18.42	10.16	6.66	7.11	7.85	11.33
13	18.78	22.48	27.90	33.22	30.67	22.74	18.11	10.03	6.61	7.12	8.15	11.57
14	19.02	22.67	28.27	33.39	30.36	22.59	17.80	9.93	6.62	7.07	8.39	11.82
15	19.19	22.88	28.58	33.50	30.07	22.42	17.46	9.80	6.57	7.01	8.51	12.13
16	19.31	23.09	28.86	33.46	29.80	22.29	17.13	9.75	6.57	6.95	8.54	12.42
17	19.39	23.27	29.10	32.80	29.55	22.19	16.83	9.67	6.55	6.86	8.51	12.73
18	19.46	23.48	29.27	33.46	29.29	22.08	16.56	9.58	6.51	6.77	8.51	13.06
19	19.06	23.72	29.43	33.58	28.99	21.94	16.29	9.52	6.51	6.75	8.55	13.30
20	18.98	23.93	29.55	33.28	28.70	21.80	16.06	9.43	6.58	6.76	8.60	13.47
21	19.37	24.15	29.68	33.22	28.40	21.65	15.79	9.35	6.64	6.75	8.65	13.66
22	19.37	24.36	29.78	33.74	28.14	21.52	15.53	9.33	6.66	6.74	8.73	13.80
23	19.33	24.59	29.91	33.07	27.93	21.42	15.30	9.30	6.70	6.71	8.86	14.01
24	19.38	24.81	30.03	32.97	27.80	21.30	15.06	9.27	6.70	6.68	9.03	14.24
25	19.50	25.06	30.17	32.87	27.72	21.13	14.81	9.19	6.68	6.66	9.23	14.47
26	19.62	25.28	30.30	32.77	27.64	20.97	14.53	9.02	6.68	6.57	9.48	14.59
27	19.73	25.50	30.43	32.70	27.57	20.83	14.22	8.82	6.67	6.50	9.76	14.68
28	19.85	25.62	30.57	32.20	27.44	20.72	13.95	8.62	6.60	6.42	10.02	14.72
29	19.93		30.68	32.56	27.24	20.64	13.75	8.42	6.39	6.38	10.28	14.75
30	20.02		30.80	32.57	27.04	20.55	13.54	8.20	6.36	6.35	10.53	14.81
31	20.10		31.06		26.73		13.45	7.92		6.38		14.95

PERIOD OF RECORD 1922 THROUGH 1978

AVERAGE DAILY FLOW(CFS)

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	454400	612200	764500	888200	880700	698400	541600	376700	254800	250500	248400	353500
2	460200	616600	765300	893400	878300	689100	540100	373000	250200	253100	248500	356200
3	469900	620200	766500	897700	873100	678600	536700	367600	246800	255600	247900	357200
4	480000	624200	768700	902000	869000	667200	533200	360200	245200	255900	249000	357500
5	490200	635500	762600	904700	866800	656700	531600	352800	245200	258300	250200	357100
6	500000	643400	763600	908000	861900	648100	527700	346400	245800	260400	252000	356300
7	508000	653300	766500	911900	859600	640200	524200	339900	245700	260700	254100	357100
8	515400	659800	766600	913800	854600	633700	518700	332100	246300	261100	257900	357500
9	525300	666100	767100	916200	845400	626700	511700	326300	246400	260900	265700	357500
10	535300	670700	768500	919200	833900	620100	504900	320400	246000	259900	273400	358000
11	545400	672500	774300	921800	823000	615100	497500	315300	246000	259900	285800	359600
12	556900	675100	780800	924500	812200	609900	488800	311200	245700	259400	294500	364500
13	568700	680700	789700	928100	802000	604400	481100	307600	246200	258900	302900	369000
14	572300	687100	795900	929100	791800	600500	472500	306000	246300	257900	307700	374400
15	576900	694500	801500	928600	784100	595700	466300	304700	245800	256400	309100	382500
16	580300	702000	807900	926000	777900	593100	459200	302800	246000	254400	308900	390100
17	581300	707600	812900	924500	772200	590600	451000	300700	243400	252500	308000	397100
18	581300	713800	815800	921900	766100	586600	444700	298700	245000	250500	307700	403400
19	581400	720300	818900	919300	758600	581400	438400	296900	246300	250100	308500	408800
20	579500	726400	823100	911500	749700	577200	432400	294700	248600	251000	310100	413500
21	577800	730300	827600	907900	742600	573500	425700	293200	249700	251400	312300	417000
22	573300	733200	832700	904600	738500	569500	419000	293200	250700	251700	314500	421700
23	579100	740400	836800	900900	734500	567200	412400	293400	252600	251100	317800	426900
24	580900	746900	840800	896800	732500	563700	406900	292200	253600	250200	321000	432200
25	582000	751800	845500	891200	731000	558000	401300	289000	254400	246600	324300	436200
26	585500	757700	850900	887400	729500	552900	395900	285100	253800	242500	328500	438600
27	589000	760800	857100	885500	727400	548900	390600	280600	253000	244200	332900	439400
28	592000	763000	863000	883400	725600	546200	387200	276400	252300	245900	338600	439300
29	596300		868700	881000	718700	544600	384900	272400	252400	246500	344600	439200
30	601300		874700	880900	711900	543200	382500	267400	252600	247900	349100	440800
31	607000		880700		705200		379900	260900		249300		443900

PERIOD OF RECORD 1922 THROUGH 1978

P332B

18. Purpose. P332B provides histograms of stage and flow over the period of record for the selected master file. It allows the user to determine frequencies of recorded values of stage and flow using the maximum and minimum values determined by P331B as upper and lower bounds. Thus, P331B must be executed prior to using P332B for the same gage master file.

19. Methodology. The computations use straightforward statistical techniques for calculating boundary intervals for the histograms. Like P331B, P332B was written by the University of Missouri at Rolla and is documented in the manuals cited above in paragraph 14. The user is therefore referred to those manuals for additional information.

20. Execution. The user logs on as usual and accesses the program as follows:

```
*RUN AODPLMVD/RIVER/P332B,R
```

21. Once execution begins, the following list is displayed:

```
RUN AODPLMVD/RIVER/P332B
USER: FOLLOWING IS A TABLE OF
      AVAILABLE FILES W/NUMBER CODES----

     1-ALEXANDRIA          2-ARKANSAS            3-CHESTER
     4-KEOKUK              5-PADUCAH             6-REDRIVER
     7-ST.LOUIS            8-VICKSBURG           9-THEBES
    10-HELENA             11-HERMANN            12-SIMMSPORT
    13-MEREDOSI           14-LITTLE ROCK        15-METROPOLIS
    16-CLARENDON          17-ALTON              18-MEMPHIS
    19-HICKMAN            20-NATCHEZ            21-ST. JOSEPH
    22-GREENVILLE         23-SELMA              24-FULTON
    25-LAKE PROVIDENCE    26-BATON ROUGE

NOW INPUT THE NUMBER CODE FOR THE DESIRED FILE.
=:
```

Next, responses to several gage data questions are entered:

```
INPUT  'LNNO' (THE STARTING PAGE NUMBER),
       PLABEL' (GAGE STATION NAME),
       GAGE (THE GAGE READING),
       'IYREND' (LAST YEAR OF RECORD),
  AND  'RIVMI' (THE RIVER MILE OF THE GAGE LOCATION),

=1,VICKSBURG,43.0,1950,00078,30250.
```

Finally, the following requests are made. Here, the user inputs the values determined from P331B:

```
INPUT  'SCMAX' (MAXIMUM STAGE),
       'SCMIN' (MINIMUM STAGE),
       'QCMAX' (MAXIMUM FLOW),
   AND 'QCMIN' (MINIMUM FLOW).

=1,-2,1858000,231000
```

22. When completed, the program computes the histograms and writes to a formatted output file for printing. The following commands print the file:

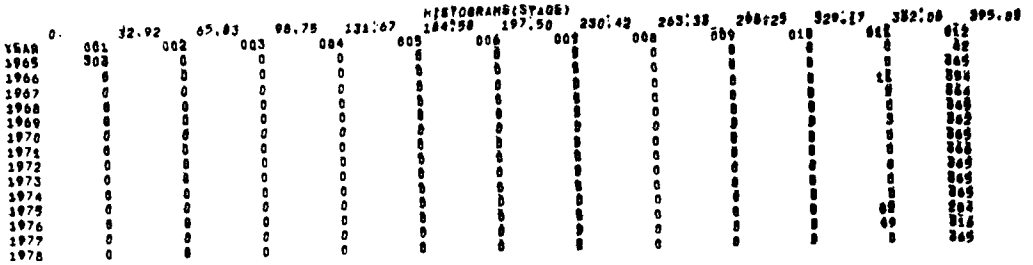
```
*PRINT   (CR)
YOUR NAME - 9 CHARACTERS OR LESS? ___YOUR NAME___ (CR)
FILE 'SUBCAT/FILE$PASSWORD'? CATALOG/FILE,R___ (CR)
FILE? NEXT FILE OR (CR)
PRIORITY(1 THROUGH 40 OR ?)? _____ (CR)
STATION CODE (00--FOR WES)? _____ (CR)
SNUMB XXXXT
```

A sample of the output is shown on pages C14-C17.

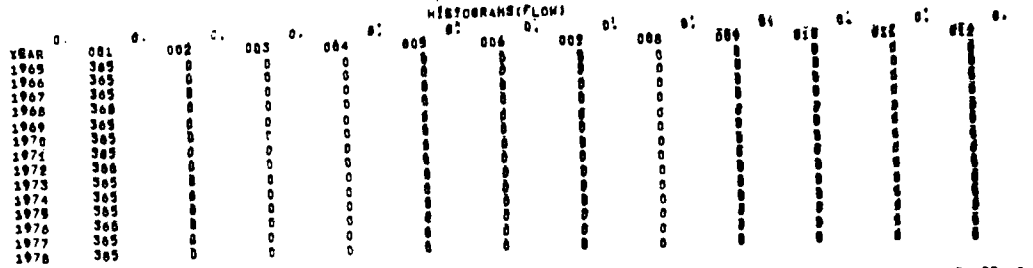
CALENDAR YEAR	AVE. MEAN DAILY STG. (FEET)	AVE. MEAN DAILY FLW (1000 CFS)	AVERAGES OVER LOWWATER SEASON JULY THROUGH NOVEMBER STAGE(FT)	FLOW(1000 CFS)	AVERAGES OVER HIGHWATER SEASON PREVIOUS DEC THROUGH JUNE STAGE(FT)	FLOW(1000 CFS)	RUNOFF (INCH)	DAYS AT OR OVER BANKFULL
1965	63.04	0.	35.18	0.	0.	0.	0.	0
1966	371.25	0.	366.45	0.	321.28	0.	0.	0
1967	372.51	0.	371.08	0.	319.86	0.	0.	16
			STAGE AT OR OVER BANKFULL		6/20 THROUGH 7/ 5			
1968	372.18	0.	373.09	0.	317.90	0.	0.	0
1969	378.90	0.	377.85	0.	326.88	0.	0.	47
			STAGE AT OR OVER BANKFULL		4/ 8 THROUGH 4/11			
			STAGE AT OR OVER BANKFULL		4/19 THROUGH 5/ 8			
			STAGE AT OR OVER BANKFULL		7/ 1 THROUGH 7/20			
			STAGE AT OR OVER BANKFULL		10/14 THROUGH 10/18			
1970	375.40	0.	376.66	0.	321.59	0.	0.	26
			STAGE AT OR OVER BANKFULL		4/22 THROUGH 4/25			
			STAGE AT OR OVER BANKFULL		5/ 2 THROUGH 5/ 6			
			STAGE AT OR OVER BANKFULL		5/17 THROUGH 5/22			
			STAGE AT OR OVER BANKFULL		6/ 6 THROUGH 6/ 9			
			STAGE AT OR OVER BANKFULL		6/16 THROUGH 6/18			
			STAGE AT OR OVER BANKFULL		9/28 THROUGH 9/30			
1971	373.24	0.	368.91	0.	321.53	0.	0.	153
			STAGE AT OR OVER BANKFULL		1/ 6 THROUGH 1/ 8			
			STAGE AT OR OVER BANKFULL		2/21 THROUGH 5/20			
			STAGE AT OR OVER BANKFULL		5/23 THROUGH 6/30			
			STAGE AT OR OVER BANKFULL		7/12 THROUGH 7/21			
			STAGE AT OR OVER BANKFULL		12/15 THROUGH 12/26			
1972	375.91	0.	377.59	0.	320.28	0.	0.	0
1973	384.39	0.	377.91	0.	333.37	0.	0.	108
			STAGE AT OR OVER BANKFULL		2/ 6 THROUGH 2/ 7			
			STAGE AT OR OVER BANKFULL		3/ 8 THROUGH 5/19			
			STAGE AT OR OVER BANKFULL		10/ 6 THROUGH 10/ 8			
1974	377.79	0.	376.20	0.	320.91	0.	0.	41
			STAGE AT OR OVER BANKFULL		1/29 THROUGH 2/ 3			
			STAGE AT OR OVER BANKFULL		3/14 THROUGH 3/18			
			STAGE AT OR OVER BANKFULL		5/21 THROUGH 6/19			
1975	375.98	0.	376.70	0.	324.65	0.	0.	12
			STAGE AT OR OVER BANKFULL		3/31 THROUGH 4/ 1			
			STAGE AT OR OVER BANKFULL		4/26 THROUGH 4/30			
			STAGE AT OR OVER BANKFULL		5/ 9 THROUGH 5/13			
1976	368.85	0.	363.36	0.	320.34	0.	0.	4

CALENDAR YEAR	AVE. MEAN DAILY STG. (FEET)	AVE. MEAN DAILY FLW (1000 CFS)	AVERAGES OVER LOWWATER SEASON JULY THROUGH NOVEMBER STAGE(FT)	FLOW(1000 CFS)	AVERAGES OVER HIGHWATER SEASON PREVIOUS DEC THROUGH JUNE STAGE(FT)	FLOW(1000 CFS)	RUNOFF (INCH)	DAYS AT OR OVER BANKFULL
			STAGE AT OR OVER BANKFULL		4/29 THROUGH 5/ 8			
1977	369.94	0.	373.69	0.	312.84	0.	0.	0
1978	379.00	0.	376.18	0.	331.08	0.	0.	34
			STAGE AT OR OVER BANKFULL		3/24 THROUGH 4/ 8			
			STAGE AT OR OVER BANKFULL		4/14 THROUGH 4/27			
			STAGE AT OR OVER BANKFULL		5/11 THROUGH 5/19			

HISTOGRAMS(STAGE)



HISTOGRAMS(FLOW)



MONTHLY RUNOFF(INCHES)

YEAR	TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1966	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1967	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1968	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1969	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1970	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1971	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1972	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1973	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1974	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1975	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1976	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1977	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AVERAGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MONTHLY RUNOFF(PERCENT TOTAL)

MONTHLY FIGURES ARE PERCENT OF TOTAL INCHES

YEAR	(INCH) TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1966	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1967	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1968	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1969	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1970	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1971	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1972	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1973	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1974	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1975	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1976	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1977	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
1978	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37
AVERAGE	0.	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37	3E 37

LONG TERM,YEARLY AVERAGES

AVE. MEAN DAILY STG (FEET)	AVE. MEAN DAILY FLW (1000 CFS)	AVERAGES OVER LOWWATER SEASON JULY THROUGH NOVEMBER STAGE(FT)	FLOW(1000 CFS)	AVERAGES OVER HIGHWATER SEASON PREVIOUS DEC THROUGH JUNE STAGE(FT)	FLOW(1000 CFS)	RUNOFF (INCH)
352.44	0.	351.22	0.	299.16	0.	0.

DEVIATIONS FROM LONG TERM YEARLY AVERAGES; YEARLY DATA

CALENDAR YEAR	AVE. MEAN DAILY STG (FEET)	AVE. MEAN DAILY FLW (1000 CFS)	AVERAGES OVER LOWWATER SEASON JULY THROUGH NOVEMBER STAGE(FT)	FLOW(1000 CFS)	AVERAGES OVER HIGHWATER SEASON PREVIOUS DEC THROUGH JUNE STAGE(FT)	FLOW(1000 CFS)	RUNOFF (INCH)
1965	-289.39	0.	-276.10	0.	*299.16	0.	0.
1966	18.82	0.	15.23	0.	22.12	0.	0.
1967	20.07	0.	19.86	0.	19.84	0.	0.
1968	19.74	0.	21.05	0.	18.34	0.	0.
1969	26.46	0.	28.63	0.	26.05	0.	0.
1970	22.97	0.	23.44	0.	22.43	0.	0.
1971	20.80	0.	17.79	0.	22.37	0.	0.
1972	23.48	0.	26.37	0.	21.12	0.	0.
1973	31.91	0.	26.74	0.	34.21	0.	0.
1974	25.35	0.	26.07	0.	29.35	0.	0.
1975	23.55	0.	20.57	0.	25.49	0.	0.
1976	16.42	0.	12.12	0.	21.18	0.	0.
1977	17.10	0.	22.56	0.	13.12	0.	0.
1978	22.56	0.	22.88	0.	22.93	0.	0.

DEVIATIONS OF MONTHLY AVERAGES FROM LONG TERM YEARLY AVERAGES (STAGE,FEET)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	-352.44	-352.44	-352.44	-352.44	-352.44	-352.44	-352.44	-352.44	-352.44	-340.38	18.25	19.05
1966	18.69	21.66	22.87	20.08	21.78	24.14	17.35	14.74	12.83	12.34	12.11	13.01
1967	18.91	14.40	16.40	20.02	24.15	31.67	28.80	16.12	13.68	10.27	20.26	20.56
1968	12.78	19.99	15.61	21.07	21.73	22.94	24.64	22.24	16.94	17.61	22.30	18.87
1969	28.24	24.56	26.31	37.23	38.43	29.64	39.34	22.48	20.38	28.68	19.85	14.44
1970	18.81	14.72	19.88	28.78	38.97	33.45	19.39	19.84	23.68	25.04	24.56	19.26
1971	15.63	28.24	30.49	27.04	25.24	25.24	20.53	14.86	13.63	14.69	19.20	22.20
1972	25.68	12.80	21.91	28.67	31.05	22.10	20.26	29.21	24.63	24.78	25.23	21.93
1973	38.44	36.32	40.17	47.01	45.86	35.84	28.98	21.99	19.05	33.93	29.62	27.69
1974	27.04	26.80	32.37	30.41	34.96	30.44	28.10	17.78	15.98	13.44	24.99	16.60
1975	19.13	24.20	28.26	32.46	38.19	28.51	29.30	17.34	18.67	18.13	17.82	19.27
1976	12.95	17.05	27.04	29.22	28.63	18.93	18.89	21.22	9.88	9.88	9.27	8.12
1977	9.88	9.45	19.84	16.07	18.45	19.28	18.99	19.34	24.48	24.67	26.03	18.04
1978	28.62	18.14	26.43	37.48	34.88	24.67	29.48	20.49	28.24	18.93	17.85	15.19

MONTHLY AVERAGES ARE ON PAGE I2

DEVIATIONS OF MONTHLY AVERAGES FROM LONG TERM YEARLY AVERAGES (FLOW,1000 CFS)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1966	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1967	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1968	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1969	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1970	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1971	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1972	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1973	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1974	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1975	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1976	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1977	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MONTHLY AVERAGES ARE ON PAGE I3

LONG TERM MONTHLY AVERAGES

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
STAGE (FEET)	[illegible].15	293.54	297.87	301.26	302.34	299.17	[illegible].39	291.47	[illegible]	292.05	319.36	357.05
FLOW (1000 CFS)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

MONTHLY AVERAGES: STAGE(FEET)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	0.	0.	0.	0.	0.	0.	0.	0.	0.	[illegible]	[illegible]	[illegible]
1966	[illegible]	374.09	325.31	360.40	[illegible]	376.57	360.79	367.10	[illegible]	[illegible]	[illegible]	[illegible]
1967	[illegible]	384.83	360.83	382.47	[illegible]	386.10	379.94	366.55	[illegible]	[illegible]	[illegible]	[illegible]
1968	380.22	372.42	360.05	373.51	[illegible]	375.38	377.60	394.44	[illegible]	[illegible]	374.11	[illegible]
1969	394.60	379.00	370.75	[illegible]	[illegible]	[illegible]	[illegible]	374.94	[illegible]	[illegible]	[illegible]	[illegible]
1970	365.65	362.16	372.31	381.20	[illegible]	[illegible]	360.83	382.28	[illegible]	[illegible]	[illegible]	[illegible]
1971	368.87	372.68	382.93	380.32	[illegible]	372.67	[illegible]	367.34	[illegible]	[illegible]	[illegible]	[illegible]
1972	[illegible]	369.24	324.35	381.30	[illegible]	375.54	[illegible]	387.69	[illegible]	[illegible]	[illegible]	[illegible]
1973	[illegible]	382.76	392.41	399.40	[illegible]	380.20	370.62	394.40	[illegible]	[illegible]	[illegible]	[illegible]
1974	399.47	380.23	384.80	382.95	[illegible]	395.90	370.94	390.26	[illegible]	[illegible]	[illegible]	[illegible]
1975	374.55	376.64	380.69	384.92	[illegible]	[illegible]	379.64	369.77	[illegible]	[illegible]	[illegible]	[illegible]
1976	365.39	369.49	380.37	381.60	[illegible]	378.97	365.99	383.45	[illegible]	[illegible]	[illegible]	[illegible]
1977	358.26	386.89	360.28	369.45	[illegible]	363.72	360.63	387.75	[illegible]	[illegible]	[illegible]	[illegible]
1978	[illegible]	362.57	329.04	389.83	[illegible]	372.11	[illegible]	382.95	[illegible]	[illegible]	[illegible]	[illegible]

MONTHLY AVERAGES: FLOW(1000 CFS)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1966	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1967	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1968	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1969	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1970	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1971	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1972	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1973	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1974	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1975	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1976	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1977	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

DEVIATIONS OF MONTHLY AVERAGE STAGE FROM LONG TERM MONTHLY AVERAGE STAGE (FEET)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	[illegible]	-298.54	-297.87	-301.26	[illegible]	-299.17	-298.39	-291.49	[illegible]	-280.76	51.33	93.64
1966	99.60	80.55	70.24	79.20	78.45	77.41	78.43	[illegible]	74.06	72.07	49.29	47.60
1967	74.60	78.29	71.76	81.21	71.39	84.94	[illegible]	87.00	[illegible]	79.80	53.34	55.15
1968	79.87	78.89	70.97	72.29	[illegible]	74.21	85.72	83.17	[illegible]	77.24	53.36	85.46
1969	83.53	85.46	81.67	66.66	85.93	82.91	96.42	83.44	[illegible]	85.22	55.53	49.03
1970	90.50	78.62	75.24	79.00	88.06	86.72	78.47	80.06	[illegible]	65.47	52.84	53.05
1971	98.92	79.14	85.85	79.12	78.33	78.91	79.61	95.83	[illegible]	76.20	[illegible]	95.79
1972	[illegible]	75.70	77.28	79.66	[illegible]	74.37	77.89	86.18	[illegible]	86.61	64.31	96.12
1973	95.31	80.22	95.94	98.10	92.45	89.11	85.07	82.99	[illegible]	95.96	58.90	63.20
1974	88.33	89.69	87.73	81.59	85.66	91.73	85.16	98.74	[illegible]	73.07	54.07	93.19
1975	86.40	83.10	83.62	83.67	85.56	81.70	[illegible]	98.30	82.40	75.76	58.10	95.06
1976	78.30	75.95	83.30	80.40	79.59	73.80	75.63	92.10	70.97	69.95	42.05	48.71
1977	67.89	60.35	71.21	68.35	67.95	68.55	73.60	96.30	88.49	84.38	59.51	93.63
1978	78.01	69.03	81.09	88.66	85.70	77.94	[illegible]	81.49	84.81	78.00	58.33	40.78

DEVIATIONS OF MONTHLY AVERAGE FLOW FROM LONG TERM MONTHLY AVERAGE FLOW (1000 CFS)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1966	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1967	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1968	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1969	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1970	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1971	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1972	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1973	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1974	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1975	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1976	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1977	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1978	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

P333B

23. Purpose. P333B was written to provide the user various statistics on stage and flow for various time intervals during each year of a selected time period of years.

24. Methodology. P333B was also written by the University of Missouri at Rolla. The user is referred to the manuals cited in paragraph 14 for a more detailed discussion of the methodology employed in the program. Some modifications were made to convert the program to time-sharing operation, reduce execution times, and alter some options originally available to the user. One of these, for example, was a formatted listing; it was deemed unnecessary to duplicate the listing again.

25. Execution. After logon, the user accesses the program file as follows:

```
GET AØDPLMVD/RIVER/P333B,R
```

```
*RUN *333E
USER: FOLLOWING IS A TABLE OF
      AVAILABLE FILES W/NUMBER CODES----


     1-ALEXANDRIA           2-ARKANSAS             3-CHESTER
     4-EDDYVILLE            5-PADUCAH              6-REDRIVER
     7-ST.LOUIS             8-VICKSBURG            9-THEBES
     10-HELENA              11-HERMANN             12-SIMMSPORT
     13-MEREDOSI            14-LITTLE ROCK         15-METROPOL
     16-CLARENDON           17-ALTON               18-MEMPHIS
     19-HICKMAN             20-NATCHEZ             21-ST. JOSEPH
     22-GREENVILLE          23-SELMA               24-FULTON
     25-LAKE PROVIDENCE     26-BATON ROUGE         27-GREENWOOD
     28-REDWOOD             29-BELZONI

NOW INPUT THE NUMBER CODE FOR THE DESIRED FILE,
=29

INPUT VALUES FOR THE VARIABLES
        (NNO (THE STARTING PAGE NUMBER),
        FLABEL (THE NAME OF THE GAGE STATION),
        GAGE (THE GAGE DATUM),
         I,PEND (LAST YEAR OF RECORD),
   AND  RIVMI (THE RIVER MILE OF THE GAGE LOCATION),

=1,BELZONI,55.,1972,454.0

INPUT VALUES FOR THE VARIABLES
        (YRA (YEAR FOR START OF PROCESSING),
        (YRB (YEAR FOR ENDING PROCESSING),


=1955,1985
```

26. Since the nature and format of the output generated require more space than the terminal printer allows, the results are sent to an output file (OUT333) for listing by the system printer. To have it printed, the user types in the following commands and executes as indicated:

```
10##N,R(your station code)  <CR>
20$:IDENT:your userid,name  <CR>
30$:CONVER <CR>
40$:OUTPUT:MEDIA/03  <CR>
50$:PRMFL:IN,R,L,AØDPLMVD/RIVER/output file desired  <CR>
60$:SYSOUT:OT
70$:ENDJOB  <CR>
```

After each entry the computer responds with the prompt sign, *. When the user has finished, he enters:

RUN

The computer responds with:

SNUMB NNNNT
*

The commands and responses appear as follows:

```
SYSTEM ?CARD N
READY
♦10==N,R(00)
♦20$:IDENT:ROKA0T1,ENETE
♦30$:CONVER
♦40$:OUTPUT:MEDIA/03
♦50$:PRMFL:IN,R,L,A0DPLMVD/RIVER/OUT333
♦60$:SYSOUT:OT
♦70$:ENDJOB
♦RUN
  SNUMB # 3186T
```

27. Samples of the output file are shown on pages C21 and C22.

INTERVALS OF MINIMUM AND MAXIMUM STAGE AND FLOW

MINIMUM VALUES

DAY INTERVAL	FROM THROUGH	AVERAGE STAGE(FEET)	DAY INTERVAL	FROM THROUGH	AVERAGE FLOW(1000 CFS)
1	12/31 12/31	33720	1	9/23 9487	143.00
7	9/28 9/28	32744	7	9/21 9487	846.87
14	9/18 10/ 1	32716	14	9/17 9486	850.84
30	9/ 2 10/ 0	31724	30	9/ 8 9475	163.00
60	8/13 10/12	9736	60	8/11 9471	805.75
90	8/23 11/20	9704	90	8/20 10483	801.84
120	9/ 3 12/31	1737	120	7/31 10467	811.34

MAXIMUM VALUES

DAY INTERVAL	FROM THROUGH	AVERAGE STAGE(FEET)	DAY INTERVAL	FROM THROUGH	AVERAGE FLOW(1000 CFS)
1	4/ 8 4/ 8	37738	1	4/ 7 94 7	1282.00
7	4/ 2 4/10	37714	7	4/ 3 94 9	1867.43
14	4/ 2 4/16	36769	14	3/29 9435	1841.93
30	3/21 4/19	34778	30	3/16 9416	1350.20
60	3/ 2 5/ 3	31703	60	3/ 1 9389	996.87
90	2/19 5/19	27756	90	2/15 9435	879.84
120	2/16 6/15	24768	120	2/14 9463	777.27
150	2/15 7/13	22706	150	1/10 94 8	911.20
180	12 8 7/ 9	20729	180	1/ 4 44 5	865.59

VICKSBURG

APP 3.3, VOL 1, PAGE 8

VICKSBURG

APP 3.3, VOL 1, PAGE 84

RECURRANCE INTERVAL DATA FOR MINIMUM STAGE(IN FORM TO BE PLOTTED)

INTERVAL (DAYS)AND AVE.STAGE(FEET)

REC.INT	1	7	14	30	60	90	120
24.00	-2.75	-3.46	-4.02	-3.90	-3.18	-2.46	-1.96
12.00	-3.60	-3.92	-4.41	-3.49	-2.86	-1.74	-0.82
8.00	-3.36	-3.78	-3.68	-1.37	0.00	-0.00	1.39
6.00	-3.20	-3.44	-2.18	-0.21	0.83	0.83	1.82
4.00	-3.00	-3.09	-0.85	0.88	2.20	1.24	2.02
4.00	-2.80	-2.69	0.00	0.77	1.81	2.75	3.15
3.43	-2.20	0.00	0.19	1.10	2.38	2.80	3.24
3.00	-2.20	0.00	0.40	1.22	2.80	3.08	4.05
2.67	-2.20	0.14	0.66	1.34	3.00	3.69	4.46
2.40	0.00	0.88	1.04	1.72	3.59	3.89	4.49
2.24	0.00	0.00	1.28	2.44	4.04	4.37	4.72
2.00	0.00	0.00	1.34	2.76	4.14	4.27	5.22
1.85	0.20	0.71	2.11	4.08	3.20	4.61	5.08
1.71	0.20	0.76	2.74	4.09	3.20	4.73	5.08
1.60	1.75	2.43	3.41	4.41	3.87	4.73	5.29
1.50	2.70	2.98	3.97	4.51	4.04	5.13	5.87
1.41	2.90	3.08	4.03	4.58	4.21	4.88	5.82
1.33	3.20	3.07	4.49	4.38	4.86	5.79	6.28
1.26	3.60	3.88	5.24	5.01	5.00	6.00	6.68
1.20	3.90	3.88	6.26	7.03	6.07	12.07	13.16
1.14	3.40	3.79	6.29	7.76	10.18	11.48	13.31
1.09	6.70	6.93	7.31	9.87	11.82	11.55	13.12
1.04	6.90	6.96	6.97	10.90	11.78	12.66	13.89

RECURRANCE INTERVAL DATA FOR MINIMUM FLOW(IN FORM TO BE PLOTTED)

INTERVAL (DAYS) AND AVE. FLOW(1000 CFS)

REC.INT	5	7	14	30	60	90	120
24.00	0.	0.	0.	0.	0.	0.	76.95
12.00	124.00	130.71	138.64	149.93	150.80	161.01	168.82
8.00	128.00	132.71	142.64	150.00	150.90	167.16	190.30
6.00	140.00	142.14	146.79	163.00	185.75	201.26	215.34
4.80	143.00	145.57	150.04	180.43	210.00	215.16	218.22
4.00	162.00	167.00	181.34	198.43	217.00	230.06	234.00
3.43	170.00	180.29	185.79	206.60	219.86	237.78	247.67
3.00	178.00	191.14	201.36	210.93	227.03	249.00	258.07
2.67	187.00	195.29	207.00	212.13	245.90	272.63	287.65
2.40	197.00	200.14	207.29	217.40	251.07	274.67	288.26
2.18	198.00	203.86	212.00	235.07	255.13	279.84	305.28
2.00	204.00	208.18	216.29	235.97	256.13	278.19	307.12
1.85	205.00	213.71	223.57	240.77	266.58	284.76	308.87
1.71	205.00	213.86	224.29	243.03	269.23	287.00	315.02
1.60	208.00	218.43	232.29	247.27	272.03	287.90	317.60
1.50	211.00	220.43	232.50	252.07	272.02	304.24	327.01
1.41	220.00	225.03	234.00	258.60	280.13	324.01	337.76
1.33	222.00	238.00	239.93	264.03	294.98	326.42	357.22
1.26	230.00	238.71	240.43	268.27	295.90	344.49	367.03
1.20	243.00	249.71	251.79	274.03	321.13	363.05	389.95
1.14	289.00	295.43	304.79	317.80	352.55	370.73	397.32
1.09	303.00	305.43	310.43	336.90	375.12	389.32	402.05
1.04	303.00	313.91	330.07	357.20	380.13	389.08	405.03

RECURRANCE INTERVAL DATA FOR MAXIMUM STAGE (IN FORM TO BE PLOTTED)

INTERVAL (DAYS) AND AVE. STAGE(FEET)

REC.INT	1	7	14	30	60	90	120	150	180
24.00	53.10	53.01	51.83	52.22	51.10	49.15	45.95	44.12	42.85
12.00	48.90	47.90	47.58	46.00	43.88	41.80	39.87	37.76	37.24
8.00	44.98	44.65	43.99	43.12	40.77	39.51	38.00	37.08	35.83
6.00	44.20	44.16	42.93	41.48	40.81	37.87	35.21	31.96	29.68
4.80	42.80	41.80	41.78	41.15	38.42	37.18	34.70	31.57	28.88
4.00	41.78	41.06	41.81	39.53	35.69	32.81	31.20	29.28	28.75
3.43	40.80	40.87	39.71	36.98	33.95	32.20	30.37	29.25	28.30
3.00	40.10	39.83	39.08	36.95	33.46	31.24	30.27	28.75	28.04
2.67	39.00	38.71	38.42	36.55	33.06	31.80	27.92	27.14	25.81
2.40	38.90	38.67	38.29	36.48	32.78	30.99	27.73	25.91	25.02
2.18	38.65	38.50	38.26	36.25	33.21	30.19	27.42	25.69	25.05
2.00	38.40	38.31	38.08	35.67	35.07	28.75	27.34	25.99	25.65
1.85	38.16	38.04	37.78	35.79	35.07	28.87	26.29	25.42	25.29
1.71	37.90	37.87	37.32	35.37	35.07	27.50	25.80	24.84	23.60
1.60	37.30	37.14	36.65	34.86	30.29	27.85	25.15	23.86	22.11
1.50	36.38	35.26	35.98	34.70	29.90	27.25	24.80	23.61	21.99
1.41	35.90	34.83	33.29	32.30	28.72	27.28	24.74	22.19	20.28
1.33	34.90	34.24	33.71	31.74	28.59	26.87	24.60	22.08	19.97
1.26	34.10	33.83	33.85	30.58	26.62	25.00	24.23	21.94	19.87
1.20	32.90	32.21	32.19	30.49	26.49	24.84	23.92	21.26	19.34
1.14	32.40	32.13	31.75	30.49	26.42	23.20	23.86	20.95	18.30
1.09	32.20	32.01	30.86	28.64	25.67	22.18	19.35	18.95	15.78
1.04	29.40	29.14	28.00	26.65	25.16	22.02	19.66	18.61	18.98

RECURRANCE INTERVAL DATA FOR MAXIMUM FLOW (IN FORM TO BE PLOTTED)

INTERVAL (DAYS) AND AVE. FLOW(1000 CFS)

REC.INT	1	7	14	30	60	90	120	150	180
24.00	1762.00	1748.71	1728.71	1688.73	1612.98	1616.48	1508.13	1434.88	1378.97
12.00	1639.00	1619.71	1709.21	1659.37	1555.85	1346.81	1272.79	1209.46	1128.82
8.00	1578.00	1559.29	1513.21	1437.27	1341.67	1236.97	1169.89	1113.49	1128.21
6.00	1520.00	1512.14	1493.86	1402.30	1303.32	1223.86	1123.90	1020.28	937.88
4.80	1430.00	1420.29	1410.71	1351.30	1219.00	1208.90	1112.04	979.29	898.00
4.00	1404.00	1382.00	1350.86	1343.67	1153.72	997.58	916.02	908.88	873.67
3.43	1334.00	1332.29	1318.79	1311.77	1188.63	986.89	907.08	858.45	818.99
3.00	1317.00	1293.57	1261.99	1294.67	1129.43	980.80	869.73	829.85	777.75
2.67	1312.00	1285.43	1258.29	1273.13	1028.35	916.69	861.33	805.35	777.44
2.40	1304.00	1283.00	1253.50	1242.00	996.67	896.85	809.60	800.38	777.42
2.18	1284.00	1273.00	1241.93	1236.20	994.97	881.83	790.29	781.82	795.09
2.00	1282.00	1261.83	1231.06	1237.47	963.48	829.84	789.89	769.35	748.52
1.85	1267.00	1245.43	1221.07	1229.17	963.32	887.68	788.65	769.83	798.53
1.71	1251.00	1238.43	1190.29	1082.60	958.00	861.33	777.87	732.88	698.30
1.60	1191.00	1185.43	1171.53	1064.80	938.10	858.76	779.26	711.20	685.59
1.50	1158.00	1142.29	1128.79	1064.43	908.47	831.99	771.07	708.03	661.72
1.41	1108.00	1089.71	1068.50	1019.57	883.50	809.88	794.02	708.03	659.64
1.33	1105.00	1068.71	1060.83	985.50	872.89	790.18	745.93	698.79	638.93
1.26	1100.00	1088.29	1048.00	963.90	829.87	776.79	743.69	678.51	638.96
1.20	1039.00	1030.14	1008.93	918.63	804.76	783.74	729.07	675.99	612.31
1.14	1016.00	998.00	978.33	897.90	798.38	745.86	713.00	668.68	605.91
1.09	985.00	978.43	948.83	873.17	785.03	709.60	647.78	668.95	548.01
1.04	977.00	969.97	948.07	856.00	708.78	679.84	598.91	640.72	518.19

P4ØØA

28. Purpose. Program P4ØØA plots stage-discharge data for selected gage stations. It is implemented on the WES computer in the time-sharing mode, uses FORTRAN as its host language, and employs GCS (the Graphics Compatibility System). Through this program the user may examine stage-discharge data for trends, unusual patterns, or other relationships. Options available to the user permit selecting the desired gage file, year of data, type of curve to plot, and mode of plotting, either screen or drum.

29. Methodology. P4ØØA processes a year of data as selected by the user. Four types of plots are provided: stage versus time, flow versus time, stage versus discharge, and discharge versus stage. The first two plots are "straight" plots in that no data manipulation occurs other than that required for the graphics code. The latter two are more involved, each one having a line fitted to the data using the least-squares fit technique. See Figures C3-C7 for example plots.

30. The basic program output consists of a plot of stage versus time, discharge versus time, or stage versus discharge. Each plot is user selectable. Initially, the user selects the gage file to use, the year to begin, and the type of plot. After completion, the user may select a new gage, new time period, and new plot type in any combination.

31. To facilitate the plotting routines, the gage data are reformatted to conform to the plot requirements and stored in arrays. Upon completion of the plot, the arrays are cleared for new data. Should the data necessary for the selected part be missing, an error message is displayed to the user and no plot is produced.

32. Execution. The user logs on to the computer as usual and then enters:

GCS2D LMVP01B

device -- (enter TK4 or DR4)

TK4 - plot only on the graphics terminal

DR4 - plot on graphocs terminal and produce plot tape for Calcomp plotter.

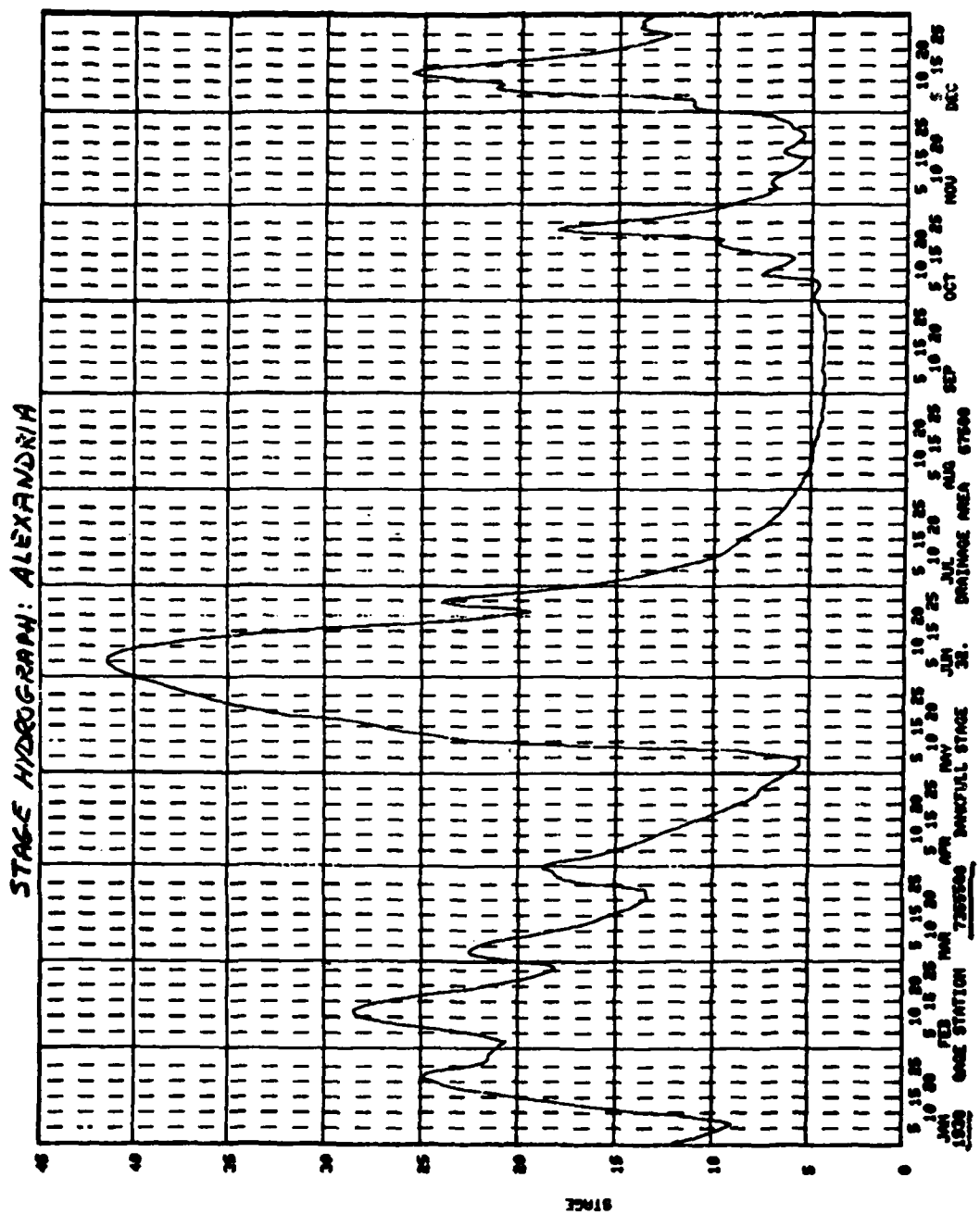


Figure C3. Example stage hydrograph

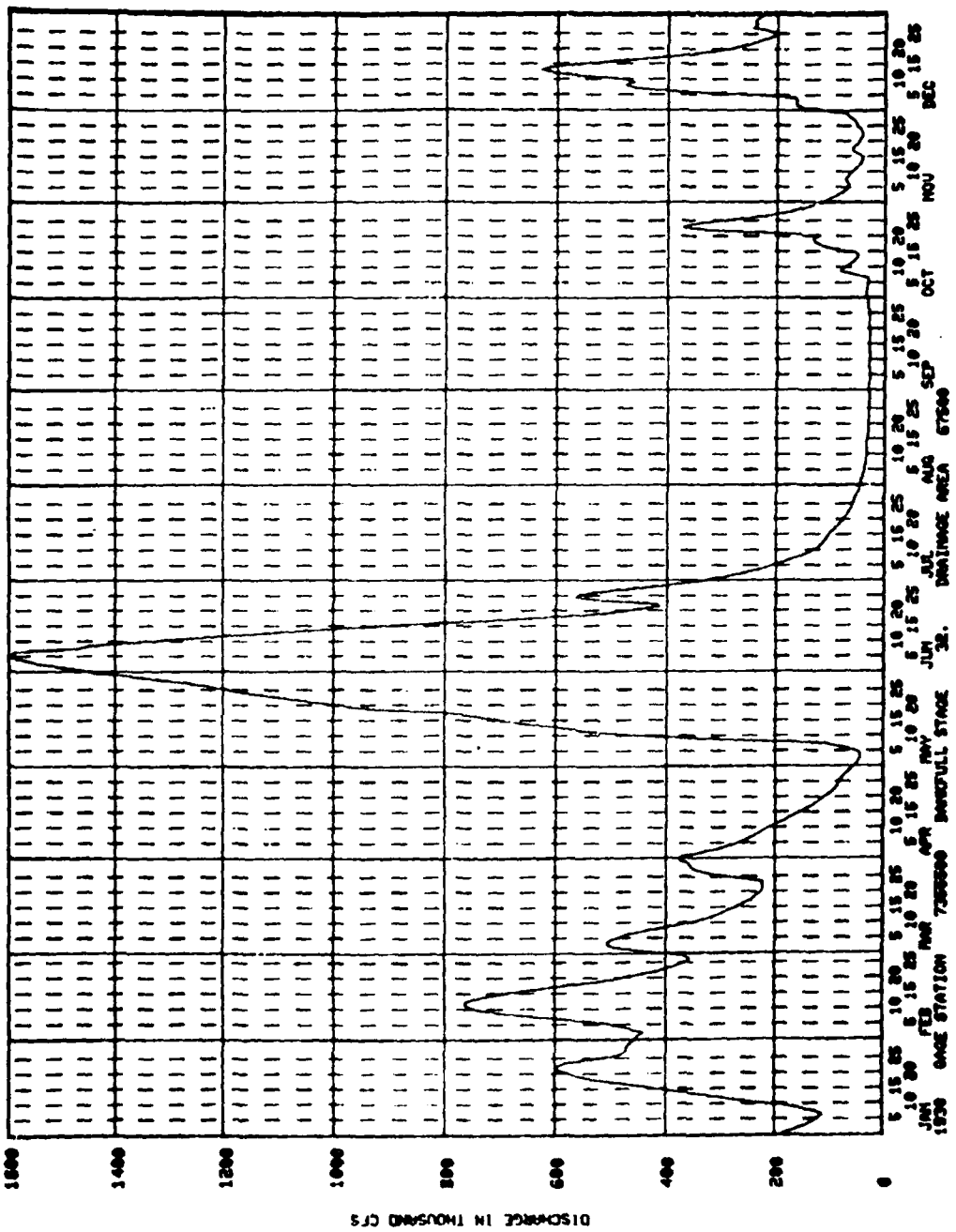


Figure C4. Example flow hydrograph

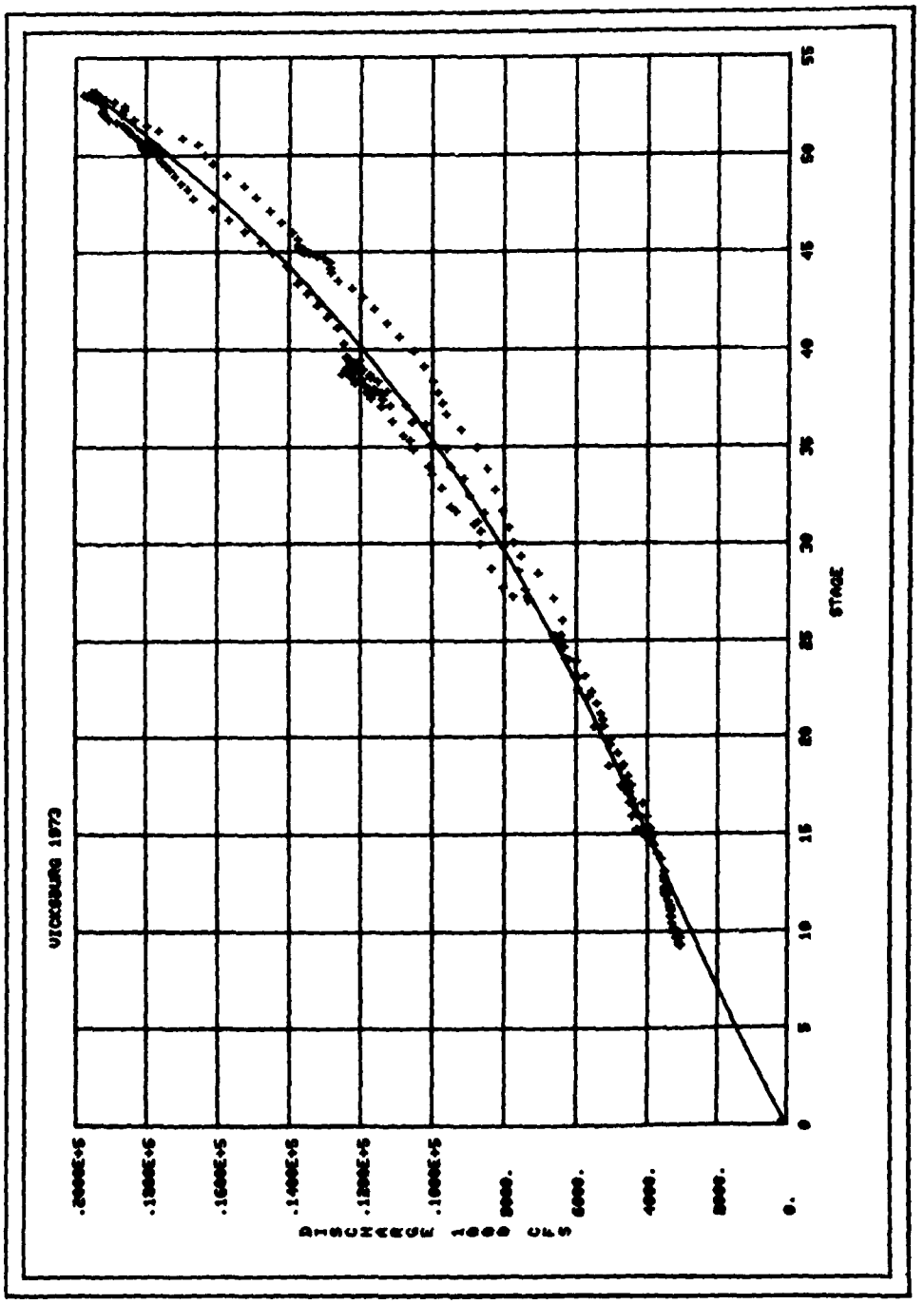


Figure C5. Example stage versus discharge plot

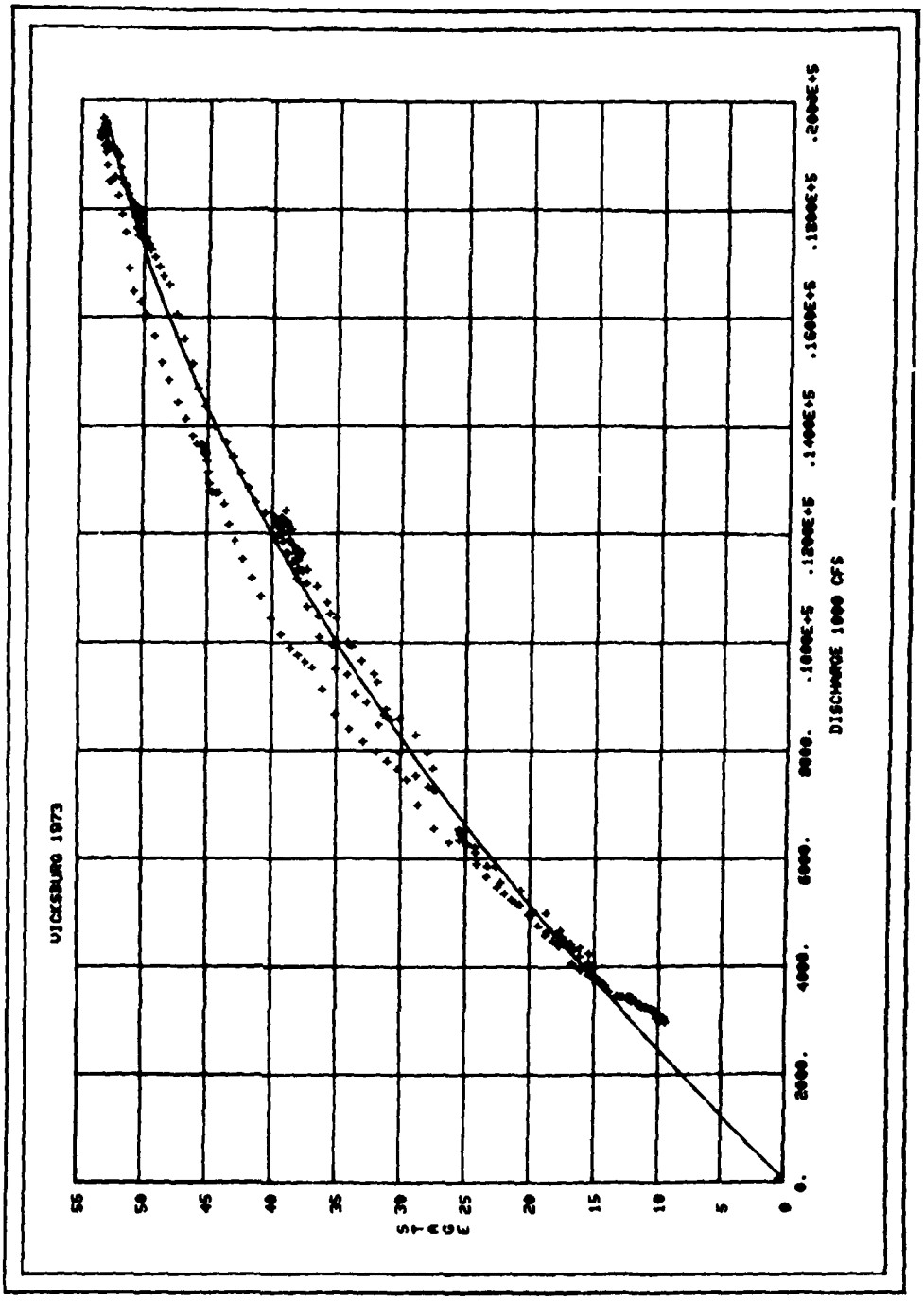


Figure C6. Example discharge versus stage plot

```
07/10/81    08.810

ENTER NAME OF STATION DESIRED
=VICKSBRG
WHAT YEAR DO YOU WANT TO PLOT?
=1973

FOR INFORMATION TYPE A '?'
ENTER COMMAND
=?
          COMMANDS                ACTIONS
        CRVF S VS Q       FITS A CURVE - STAGE VS DISCHARGE
        CRVF Q VS S       FITS A CURVE - DISCHARGE VS STAGE
        HYDR D VS Q       PLOTS A HYDROGRAPH - DAYS VS DISCHARGE
        HYDR D VS S       PLOTS A HYDROGRAPH - DAYS VS STAGE
        NEW               RETURNS TO MAIN PROGRAM TO READ ANOTHER
                          GAGE STATION AND YEAR
        DIF YR            RETURNS TO MAIN PROGRAM TO READ ANOTHER
                          YEAR OF DATA FROM SAME GAGE STATION
        STOP              TERMINATES PROGRAM
ENTER COMMAND
=STOP

$
```

Figure C7.

From this point on, the program prompts for responses and provides the selected plot upon completion of input. A sample actual execution is shown in Figure C7.

Appendix D: Hydrologic Cross-Sectional Analysis Program

1. This appendix describes the features of program P5ØØA. It computes weighted reach values of selected reaches of the Mississippi River and is implemented as a time-sharing program on the WES computer.

2. The program is designed to compute the reach characteristics for single or divided channel reaches covering the entire LMVD portion of the Mississippi River. Data used in the program consist of the cross-sectional survey data for each District in LMVD. At present, only two Districts have data available, Memphis and St. Louis. Vicksburg and St. Louis will be included when received.

3. Final output results of the program consist of averages for:

   a. Channel width (W).

   b. Hydraulic radius (R).

   c. Cross-sectional area (A).

   d. A/W ratio.

   e. $AR^{2/3}$ value.

These values are derived from the cross-sectional data for each cross section contained within the selected reach. Each reach is selected by the user by specifying a beginning river mile and water surface elevation and an ending river mile and elevation. For each cross section selected, the channel width, hydraulic radius, cross-sectional area, A/W ratio, and $AR^{2/3}$ value are computed and stored internally. These values are then weighted and averaged to give the required results for the reach.

Technical considerations

4. Data handling. Guidance for preparation of the survey data indicated that the format for the HEC-2 input data was to be followed with some minor changes. This required that each record in the file be coded with a 2-letter code to identify it. These codes are "T1," "T2," "X1," and "GR." Examination of the St. Louis data showed some of the record types missing. Since "T1" and "X1" types are essential for computing purposes, the program checks to determine if those records are present. If either record is missing for a survey section, all of the cross-sectional data are skipped. "GR" records contain the actual survey

point data formatted to contain at most 5 points per record. The "X1" record contains one parameter that gives the number of points in the survey. If a "GR" record is missing, insufficient points are read in, and the program adjusts the parameter to correspond to the number actually present.

5. Water surface elevation adjustments. In order to adjust for different water surface elevations the program permits the user to specify those elevations when defining the beginning and end of the study reach. Specifically, the water surface elevation for the beginning river mile of the reach and for the ending river mile are input as data values. Through a straight linear interpolation procedure, the corresponding water surface elevation is computed for each river mile in the study reach. Adjustments to the points in the cross section are made by adding algebraically the adjustment value:

$$SXFT = ((RM-RMSO/(RME-RMS))*(EFT-SFT)$$

where

RMS = starting river mile

RME = ending river mile

SFT = starting water surface elevation of reach

EFT = ending water surface elevation of reach

RM = river mile of cross section

SXFT = the adjustment elevation for river mile cross section

Each cross-sectional point in the survey is adjusted as follows:

$$D_{adj} = SXFT - D_{init}$$

where

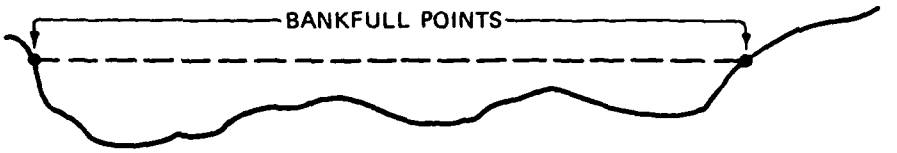
D_{init} = initial values of cross-sectional points

SXFT = adjustment elevation for cross section

D_{adj} = adjusted cross-sectional points

6. Bankfull points calculations. Bankfull points are defined as those points at which contact is made between the river bank sides and

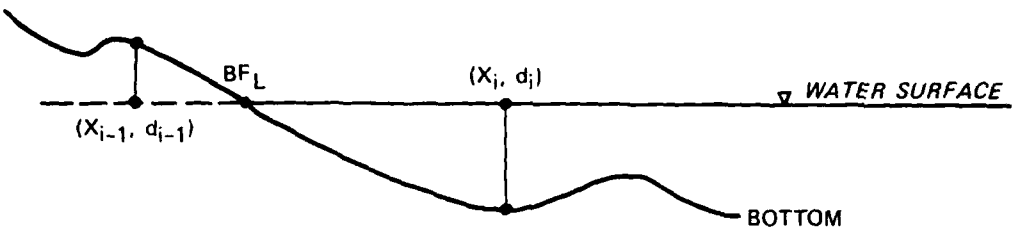
the water level for the water surface elevation of the cross section.



They are determined as follows:

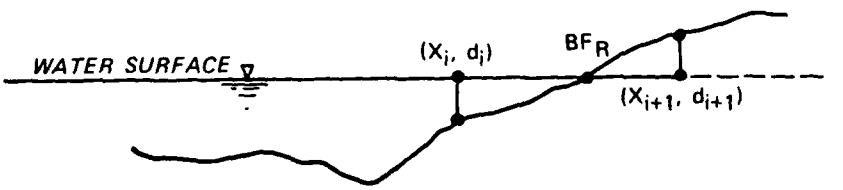
a. Left bankfull point of section (BF_L):

$$BF_L = \frac{d_{i-1}}{d_{i-1} - d_i} (X_i - X_{i-1}) + X_{i-1}$$



b. Right bankfull point (BF_R):

$$BF_R = X_{i+1} - \frac{d_{i+1}}{d_{i+1} - d_i} (X_{i+1} - X_i)$$



This calculation in the code proceeds from the rightmost point in the survey and works back through the points as opposed to the BF_L calculation which starts at the beginning of the survey.

7. Hydraulic radius computation. The wetted perimeter must be determined prior to computing the hydraulic radius. This perimeter (P) is determined as follows:

$$P = \sum_{i=1}^{n-1} p_i$$

where n is the number of points in cross section and

$$p_i = \sqrt{(d_i - d_{i-1})^2 + (IX_i - IX_{i-1})^2}$$

Also, the cross-sectional area (A) must be computed using the trapezoidal rule:

$$A = \sum_{i=1}^{n-1} a_i$$

where

$$a_i = \left[\frac{1}{2}(d_i + d_{i-1})\right] \times [(IX_i - IX_{i-1})]$$

The hydraulic radius (R) is given by

$$R = A/P$$

8. A/W ratio computation. Having determined the area previously, to obtain the A/W ratio calls for simply computing the channel width (CW) at the bankfull points. This is computed by

$$IX_{BF_R} - IX_{BF_L} = CW$$

and

$$A/W = A/CW$$

9. $AR^{2/3}$ value. This value is the product of the cross-sectional

area and the hydraulic radius raised to the 2/3 power.

10. Weighted average computations. Each reach has several cross sections comprising its length. Since the spacing of the cross sections is not uniform, a weight is computed and assigned to each one. These weights are derived as follows:

$$WT_i = \frac{RM_i - RMS}{AVG}$$

where

WT_i = weight for i^{th} cross section

RM_i = river mile location of cross section

RMS = input starting mile of reach

AVG = average interval for each section computed by:

$$AVG = \frac{RM_n - RM_1}{NSEC}$$

where

RM_n = river mile of last section in reach

RM_1 = river mile of first section in reach

NSEC = number of section in reach

The computed hydraulic values in paragraphs 7-9 above are multiplied by the weight for the particular cross section and summed as computed. When all sections are completed, the averages for the reach are found by dividing each hydraulic computation by the number of sections in the reach. For example, the weighted value for the reach hydraulic radius is found as follows:

$$R = \frac{1}{n} \sum_{i=1}^{n} (hr_i wt_i)$$

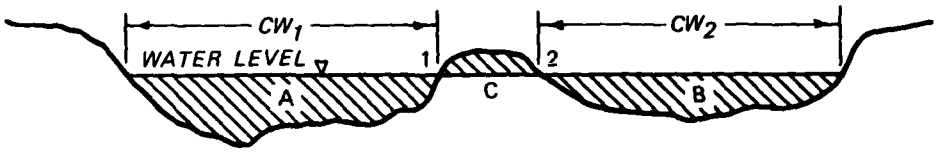
where

hr_i = hydraulic radius for i^{th} cross section

wt_i = weight for i^{th} cross section

n = number of sections

11. Divided flow calculations. Water surface elevations that produce divided flow conditions are treated by eliminating the portion of the channel above water. This is done by stepping through the cross-sectional points and testing each for a negative depth, indicating above-water condition. All such negative depths are eliminated from the cross section producing only those points at or beneath the water level. As illustrated, areas A and B below



are used, but area C is not included. By using an interpolation process for points 1 and 2, only a channel width ($CW_1 + CW_2$) is determined and all subsequent calculations are based on the areas A and B.

12. Execution time. Execution time of the program is dependent upon the file used and the length of the selected reach. Each river mile has approximately 5 cross sections and each cross section an average of 20 survey points; thus, processing time is directly dependent upon the length of the reach. A 1-mile reach takes approximately 0.003 seconds of processor time to compute and print out the values. For the St. Louis data, this estimate increases to 0.018 second per mile due to file organization.

Program description

13. Program organization consists of a main routine and four subroutines. The main routine performs the functions of user inquiry and response, file access, record retrieval, and cross-sectional storage. Subroutine INTPL adjusts the cross-sectional points for proper depth and interpolates for the bankfull depths at the bankfull points. Subroutine SUB1 computes and stores the hydraulic values for the cross section using subroutine INTVL to interpolate the points for divided flow conditions. Subroutine SUB2 computes the weighted average hydraulic values for the reach and displays these values at the user's terminal.

14. The desired reach to be studied is identified by its

beginning and ending river mile and associated water surface elevations. These are entered into the program by the user upon request starting with the lesser river mile. A search is made sequentially through the data for all cross sections that lie within the parameters, including those coincident with them. Each cross-sectional river mile is also checked against those previously selected, and if duplicated that section is rejected.

15. As a user option, the data file to be used must be specified by entering the appropriate code of the desired file. The program then attempts to attach this file for use. In the event the file cannot be attached properly, an abort message is displayed to the user. This message will contain the code causing the abort and may be used to determine the file status at the time of the abort. Help in determining the nature of abort is available through the user service unit in the ADP Center at WES, Ext. 2131.

16. At the end of the execution, the user has the option of specifying a new reach or changing to a new survey file. These changes are made in response to the appropriate requests made by the program. By such means, the user can examine the same reach over different years, different reaches within the same year, or different reaches in different years.

17. The following example describes actual execution of the program:

a. The user logs on to the computer using his userid and password.

b. He issues a mount command to ready the disk pack containing the data files and executable programs:

```
SYSTEM ?FORT N
READY
*

*MOUNT DP642
6818T EXECUTING
6818T STATUS CHANGING
6818T -01   IN LIMBO
6818T -01   WAIT-PERIP
6818T -01   WAIT MEDIA
6818T -01   EXECUTING
 DISK MOUNTED, PROGRAM ENDS
```

c. He then makes the program ready for execution:

```
*GET AODPLMVD/LMVLIB/LMVHB,R
*RUN LMVHB
```

d. Next, he executes the program through responses to program prompts:

```
SELECT PERIOD OF RECORD FROM LIST:
     1 --- MEMPHIS - 1973
     2 --- MEMPHIS - 1961
     3 --- MEMPHIS - 1948
     4 --- MEMPHIS - 1913
     5 --- MEMPHIS - 1819
 INPUT PERIOD-OF-RECORD CODE.
=3
 INPUT REACH NAME,YEAR.
=MEMPHIS,1973
 INPUT STARTING RIVER MILE AND WATER SURFACE
    ELEVATION TO NEAREST TENTH OF A FOOT.
=596.,125.
 INPUT ENDING RIVER MILE OF REACH AND WATER
    SURFACE ELEVATION.
=610.,135.
```

e. Finally, he chooses appropriate options to restart or *terminate execution as desired:*

```
COMPUTE NEW REACH?  (Y OR N)
=N
CHANGE TO NEW SURVEY FILE  (Y OR N)
=N
COMPUTE NEW REACH?  (Y OR N)
=N
CHANGE TO NEW SURVEY DATA FILE?  (Y OR N)
=N
STOP          RUN COMPLETE

*BYE
```

18. Output appears as follows:

RIV-MI	W-S-EL	CHNL-WD	HY-RAD	C-S-AREA	F.W-R	AR-2/3	MT
[illegible]00.17	110.0	1542.35	21.09	32617.66	21.15	[illegible]43772.9[illegible]	0.7436
[illegible]00.37	109.9	1564.48	21.60	34147.37	21.86	[illegible]46976.43	0.8749
[illegible]00.55	109.9	1467.32	15.71	21254.22	18.75	[illegible]20858.73	0.7274
[illegible]00.75	109.9	1408.62	15.62	21014.03	18.68	210879.71	0.8749
[illegible]00.97	109.8	1999.22	19.00	26038.52	19.02	143971.33	0.9424
[illegible]01.14	109.9	2949.20	12.10	27251.52	12.11	143621.94	0.74 [illegible]
[illegible]01.34	109.7	2593.31	10.25	26614.39	10.26	125611.64	0.81[illegible]
[illegible]01.52	109.7	2660.65	10.02	26768.45	10.06	124429.34	0.8[illegible]
[illegible]01.72	109.7	2549.22	11.17	26141.63	10.21	122864.21	0.8311
[illegible]01.96	109.6	2419.58	11.06	26759.39	11.06	132819.09	0.7874
[illegible]02.10	109.6	2121.62	14.46	30712.65	14.45	182460.60	0.8749
[illegible]02.29	109.5	1853.20	18.79	34448.51	18.79	241382.74	0.7874
[illegible]02.51	109.5	1738.02	16.56	28796.06	16.57	187057.92	0.9624
[illegible]02.69	109.5	1561.36	16.00	29861.10	16.01	189217.99	0.8311
[illegible]02.[illegible]	109.4	1892.57	18.01	34100.71	18.02	238[illegible]3.40	0.7874
[illegible]03.03	109.4	1860.15	17.86	33249.50	17.87	8271[illegible]9.87	0.9186
[illegible]03.23	109.3	1729.18	9.17	15958.13	9.17	[illegible]9462.38	0.9186
[illegible]03.43	109.3	1710.18	11.51	19701.49	11.52	10045[illegible].68	0.8311

SEARCH-TO :MEM3
YEAR :1982

BEGINNING RIVER MILE: [illegible]00.00
[illegible] RIVER MILE : 810.00

AVERA[illegible]
CHANNEL WIDTH: 1[illegible]73.24
HYDRAULIC RADIUS: 17.52
CROSS-SEC AREA: 21[illegible]86.60
AREA-WIDTH RATIO: 13.60
AREA: 0.134[illegible]E 08

CO[illegible] -MILE AVERAGES? (Y OR N)
=N

19. The user may also obtain plots of selected cross sections by executing program P600A. Each cross section is selected by river mile from the selected data file and plotted separately from any other section. A means of adjusting the water surface elevation is also provided.

20. Below is a sample execution of the program:

a. The user logs on to the computer and calls up PODAPS as indicated:

```
COEWES HIS TIMESHARING ON  01/08/82 AT  9.228  CHANNEL 2131 TS1

USER ID --ROKAOWCB
PASSWORD--
[redacted]
#USERS=022 TSS=090K %MEM-USED=02 SYS=0103K #PRO=2 000-WAIT-000K

•FRN A00PLMVD/LMVLIB/PODAPS.R
```

b. The user responds to the questions asked by PODAPS as indicated by the underlined responses below:

```
DO YOU NEED ADDITIONAL INFORMATION TO RUN THIS PROGRAM (Y OR N) ? N

FOLLOWING IS A LIST OF PROGRAMS AVAILABLE FOR THE POTAMOLOGY
 DATA PROCESSING SYSTEM (PODAPS)


1---GMAIN---GAGE DATA INPUT & RETRIEVAL
2---P331B---AVERAGE, MAXIMUM & MINIMUM STAGE & FLOW
3---P332B---STATISTICAL DATA & HISTOGRAMS FOR STAGE & FLOW
4---P333B---MAXIMUM & MINIMUM STAGE & FLOW
5---P400A---PLOTS OF STAGE-FLOW DATA
6---P500A---CROSS SECTION SURVEY ANALYSIS
7---P600A---PLOTS OF CROSS SECTION DATA


ENTER NUMBER OF DESIRED PROGRAM.


 ? 7
device-TK4
```

c. At this point, P600A executes and prompts the user as follows:

```
        01/08/82    08.232

ONLY MEMPHIS DATA AVAILABLE AT THIS TIME.
DO YOU WANT TO CONTINUE (Y OR N)?
=Y
SELECT DESIRED FILE FROM FOLLOWING LIST:
1----HYDRO-1 - 1973 MEMPHIS DATA
2----HYDRO-2 - 1962 MEMPHIS DATA
3----HYDRO-3 - 1948 MEMPHIS DATA
4----HYDRO-4 - 1912 MEMPHIS DATA
5----HYDRO-5 - 1878 MEMPHIS DATA
INPUT CODE FOR DESIRED FILE.
=1
ENTER NUMBER OF CROSS SECTIONS TO BE PLOTTED - NOT TO EXCEED 4.
=2
ENTER RIVER MILE OF CROSS SECTION. (XXXX.XX)
=596.00
ENTER RIVER MILE OF CROSS SECTION. (XXXX.XX)
=596.50
WOULD YOU LIKE TO INPUT AN ADJUSTMENT FOR WATER SURFACE
 ELEVATION (Y OR N)?
=N
```

d. Sample plots are shown on pages D12 and D13.

e. Upon entering the plots, the program prompts as follows:

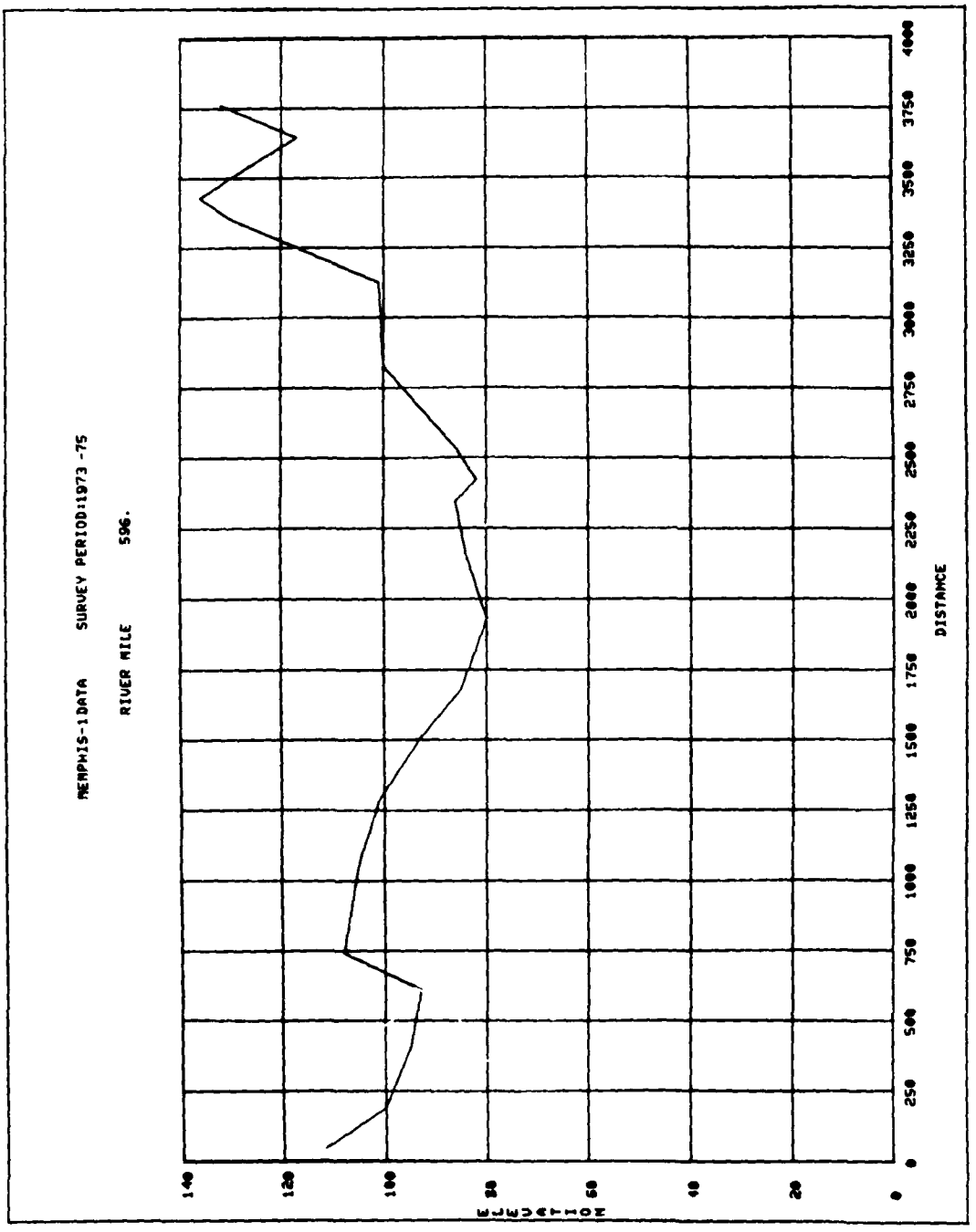
```
WHICH OF THE FOLLOWING OPTIONS WOULD YOU LIKE:
      1) STOP
      2) MORE PLOTS, SAME FILE
      3) MORE PLOTS, DIFFERENT FILE
*1
```

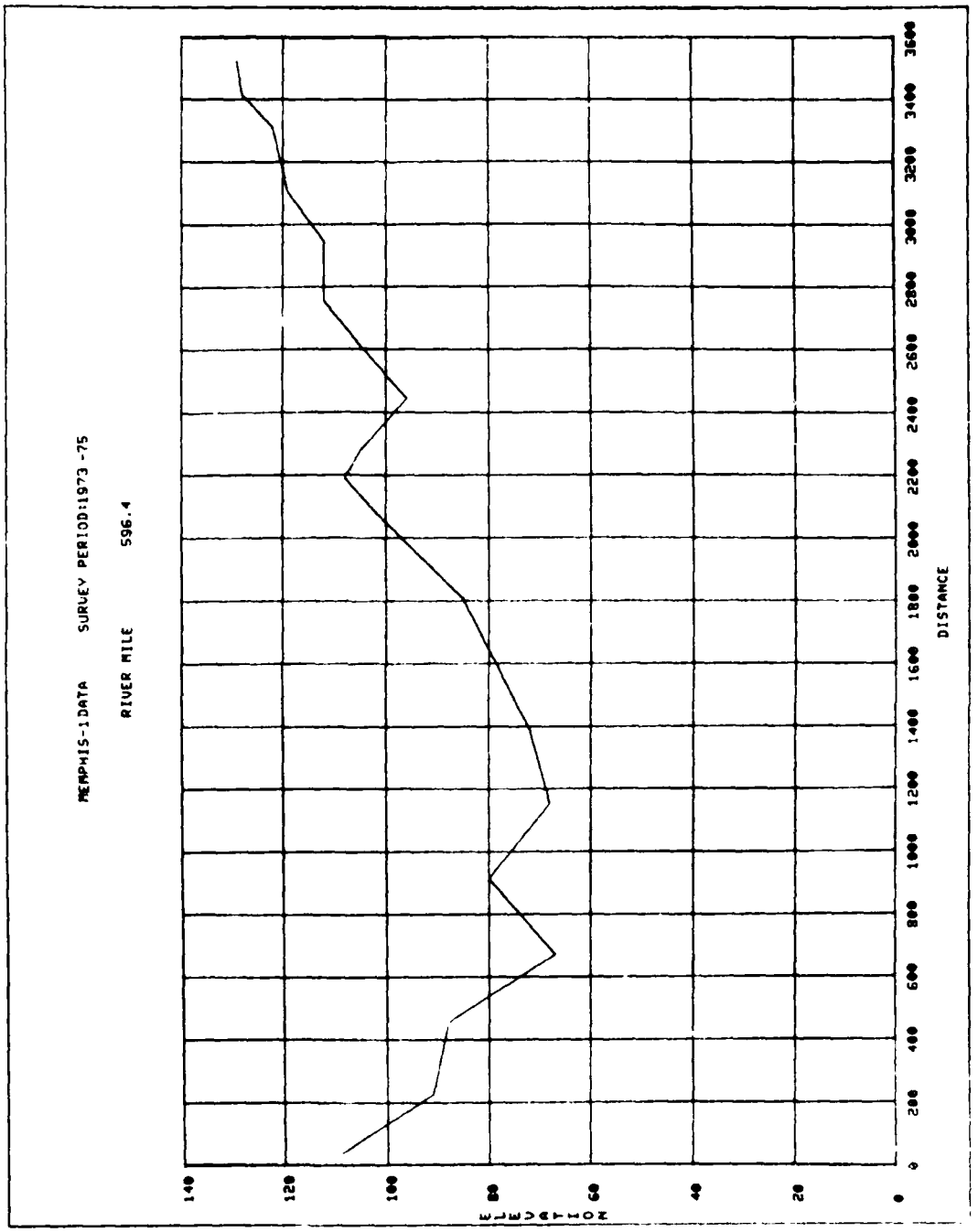
f. A response of "1" returns the user to PODAPS which prompts as follows:

```
WOULD YOU LIKE TO EXECUTE ANOTHER PROGRAM FROM PODAPS  (Y OR N) ? N


EXECUTION COMPLETE, PROGRAM WILL TERMINATE.
```

g. The user may then log off:

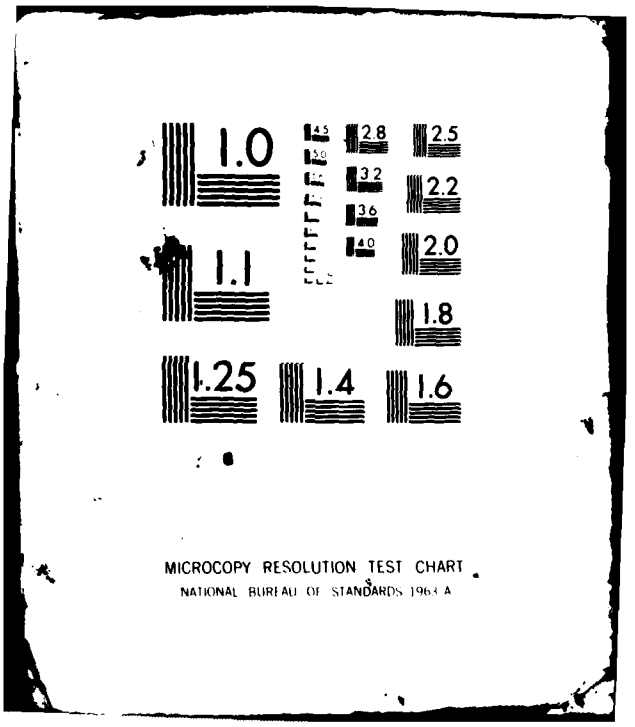
```
*BYE
**cost:  $   0.97 to date:  $   17.33=  1%
**on at  9.228 - off at  9.249 on  01/08/82
```


MEMPHIS-1 DATA SURVEY PERIOD:1973 -75
RIVER MILE 596.
ELEVATION
140
120
100
80
60
40
20
0
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000
3250
3500
3750
4000
DISTANCE


MEMPHIS-1 DATA SURVEY PERIOD:1973 -75
RIVER MILE 596.4
ELEVATION
DISTANCE
140
120
100
80
60
40
20
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600

AD-A111 848 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS F/G 8/8
USER'S GUIDE FOR THE POTAMOLOGY DATA PROCESSING SYSTEM (PODAPS)--ETC(U)
JAN 82 W L ENETE, S BROOKS
UNCLASSIFIED WES-INSTRUCTION-K-82-2 NL

END
DATE FILMED
4 82
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

Appendix E: Miscellaneous Programs and Executions

PDØ1

1. Program PDØ1 generates the dredge operations report using the dredge file. It is written in COBOL because of the character nature of most of the data in the dredge file. See paragraphs 8-12 of Appendix A for a discussion of formats and computations.

2. Execution of PDØ1 is in batch mode. The job control language and deck setup are shown below:

```
0001  $      SNUMB   R0016
0002  $      IDENT   ADDPLMVD,ENETR
0003  $      MSG$    001800/1200
0004  $$     USERID  ADDPLMVD$######
0005  *$     COBOL   NDECK
0006  *$     EXECUTE
0007  $      LIMITS  15,25K,,5080
0008  $$     PRMFL   F3,R,B,ADDPLMVD/RIVER/DREDGE$#######
0009  $      FILE    F0,X9B,20L
0010  *$     CONVER
0011  $      FILE    IN,X9R
0012  $      PRINT   0*
0013  $      ENDJOB
```

3. Output from the program appears as follows:

DREDGING OPERATIONS
VICKSBURG DISTRICT
1930-1978

YEAR	MAINTENANCE	CONSTRUCTION	MISC.	TOTALS
	CU. YDS IN THOUSANDS			
1930				
1931				
1932	1,783.8			1,783.8
1933	8,084.9			8,084.9
1934	13,802.5			13,802.5
1935	17,369.0			17,369.0
1936	20,322.5	305.5		28,628.0
1937	31,271.2			31,271.2
1938	20,827.7			20,827.7
1939	15,625.9	663.9		16,289.8
1940	15,260.0	97.8		15,357.8
1941	16,729.3			16,729.3
1942	31,347.9		285.1	31,633.0
1943	18,140.7			18,140.7
1944	9,207.9			9,207.9
1945	3,512.9			3,512.9
1946	4,850.9			4,850.9
1947	3,902.4		110.0	3,913.4
1948	5,722.2			5,722.2
1949	2,656.0			2,656.0
1950	5,545.5			5,545.5
1951	1,283.1			1,283.1
1952	4,311.9			4,311.9
1953	3,497.7			3,497.7
1954	4,202.0			4,202.0
1955	5,999.6			5,999.6
1956	5,420.8			5,420.8
1957	5,092.4			9,092.4
1958	7,581.3			7,581.3
1959	3,317.5			8,317.5
1960	7,997.8			7,997.8
1961	9,626.1			9,626.1
1962	10,257.0			10,257.0
1963	11,797.1			11,797.1
1964	10,506.7			10,506.7
1965	13,202.3			13,202.3
1966	11,103.7	51.4		11,155.1
1967	10,421.2			10,421.2
1968	12,505.1			12,505.1
1969	10,760.7			10,760.7
1970	20,787.9			20,787.9
1971	4,336.4	252.9		4,589.3
1972	7,028.8			7,028.8
1973	8,833.5			8,833.5
1974	11,261.7			11,261.7
1975	7,547.4			7,587.4
1976				
1977				
1978				

Each District's dredging operations are printed, although only Vicksburg is shown. Note that dollar values are missing. The current version does not print those at present. Obtaining these costs would only require minor modifications to the program.

Other programs

4. Programs for producing the dike, levee, and revetment lists have not been written yet. These will be designated PRØ1, PRØ2, and PRØ3. When completed, this user's guide will be updated to describe their execution.

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Enete, Walter L.
User's guide for the potamology data processing system (PODAPS) / by Walter L. Enete, Sherry Brooks (Instruction report, U.S. Army Engineer Waterways Experiment Station). -- Vicksburg, Miss. : The Station ; Springfield, Va. : available from NTIS, 1982.
96 p. in various pagings : ill. ; 27 cm. --(Instruction report ; K-82-2)
Cover title.
"January 1982."
Final report.
"Prepared for U.S. Army Engineer Division, Lower Mississippi Valley."

1. Electronic data processing. 2. Hydrology. 3. Mississippi River. I. Brooks, Sherry. II. United States. Army. Corps of Engineers. Lower Mississippi Valley

Enete, Walter L.
User's guide for the potamology data processing : ... 1982. (Card 2)

Division. III. U.S. Army Engineer Waterways Experiment Station. Automatic Data Processing Center. IV. Title V. Series: Instruction report (U.S. Army Engineer Waterways Experiment Station) ; K-82-2.
TA7.W34i no.K-82-2